JC Thermal Monitor - System Description

System description of purpose, architecture, user interfaces and typical use cases of JC Thermal Monitor.

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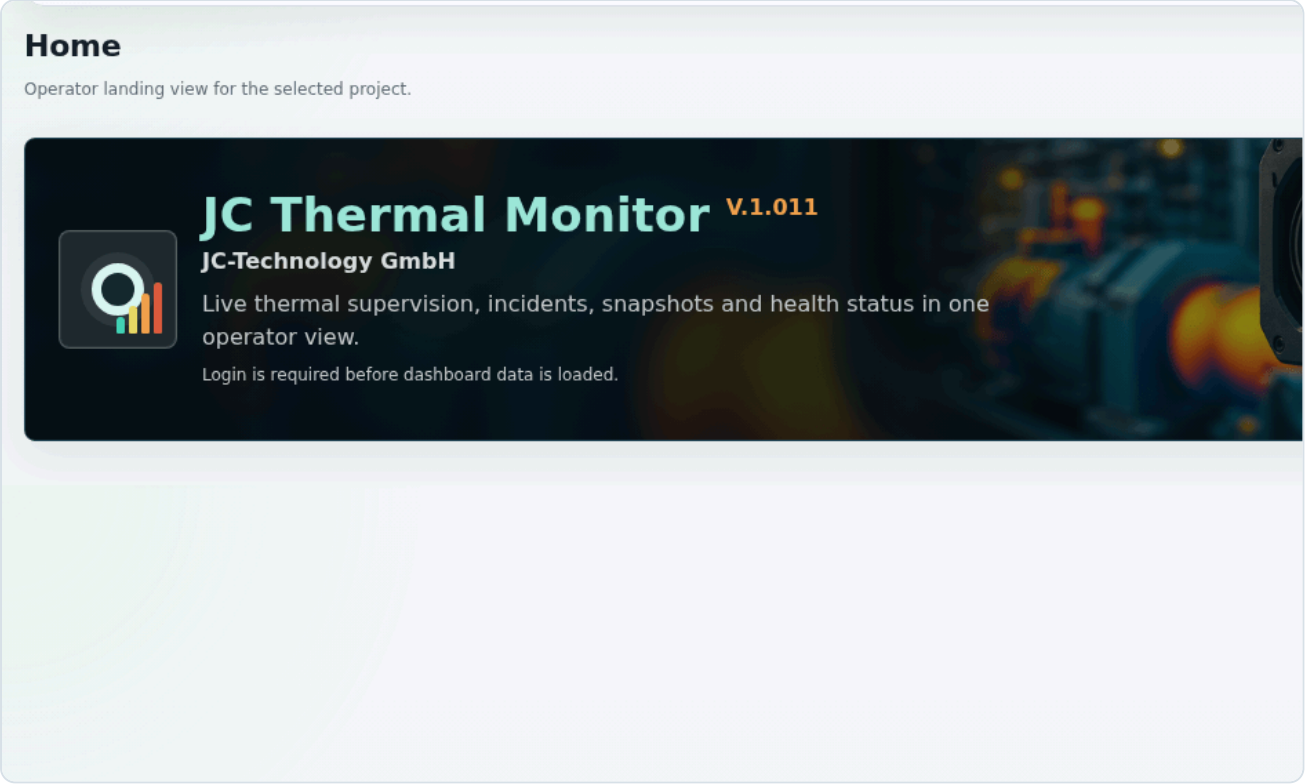
This document is an English system description of JC Thermal Monitor for prospective customers, interested parties, and operators. It explains what the system is for, which workflows it supports, and what each UI page is used for.

The text follows the current application behavior and UI Help texts. It is intended as a system description and operator orientation document, not as a developer or deployment manual.



JC Thermal Monitor dashboard

What Is The System For?

Thermal Monitor is an industrial monitoring application for FLIR AX8 thermal cameras. The system collects, stores, displays, and evaluates temperature and digital signals, and starts alarm/incident workflows based on configurable rules.

Typical goals:

- supervise thermal cameras and measurement points;
- detect critical temperature or digital states;
- record alarm events, incidents, snapshots, and evidence;
- support operator and technician investigation workflows;
- provide project-, location-, and role-based operational visibility.

Main Concepts

- **Project**: the top-level operational boundary. Locations, devices, rules,

incidents, tickets, health views, snapshot jobs, report settings, and most operator pages work inside a project context.

- **Current project**: the active working context selected in the top project

selector. Home, Rules, Incidents, Tickets, Snapshots, Health, and Visualization follow this project.

- **Location**: a deployment or monitoring place inside a project. A camera or

another device can be assigned to it.

- **Device**: currently usually a FLIR AX8 camera from which the system reads

measurement, image, and digital data.

- **Deployment / assignment**: an active assignment of a device to a location.

It can be runtime-enabled or runtime-disabled.

- **ROI**: a camera-side measurement area or point. Supported AX8 ROIs are

`Spot 1..6`, `Box 1..6`, `Digital Input`, and `Digital Output`.

- **Virtual Alarm Rule**: a project-level alarm rule with conditions, optional

filters, and actions.

- **Rule filter**: an allow/block layer that runs after rule conditions. Even

with true conditions it may block incident opening and actions if a schedule or dependency condition is not satisfied.

- **Incident**: an event created or reactivated by an alarm, potentially

requiring operator handling.

- **Ticket**: an investigation or work workflow linked to an incident.
- **Action job**: a database-queued incident action task processed by a

separate action worker so slow actions do not block live measurement ingest.

- **Snapshot job**: a database-queued image capture task processed by a

separate snapshot worker.

- **Operational Health**: a shared diagnostic view for device, ROI, worker,

rule, action, snapshot, and impulse runtime states.

Main Architecture

The system runs as a web-based monitoring application with dedicated background processes for camera polling, action execution, snapshots, and timed digital output impulses:

- **Web UI and API**: the operator interface for projects, locations, rules,

incidents, tickets, snapshots, health, visualization, settings, and users.

- **Poller**: reads camera status, thermal ROI values, DI/DO states, and

evaluates Virtual Alarm rules from fresh runtime values.

- **Action worker**: executes queued incident actions such as output writes,

torch control, snapshot requests, impulse commands, event rows, and email notifications without blocking live measurement ingest.

- **Snapshot worker**: captures and stores snapshot evidence images.
- **Impulse worker**: advances timed DO impulse sequences independently from

the measurement ingest cadence.

- **Database and file storage**: keep configuration, measurements, incidents,

tickets, snapshots, evidence, users, and runtime diagnostics.

Measurement And Alarm Data Flow

The typical data flow is:

1. A camera/device is assigned to a location inside a project.
2. ROI sync creates or updates the supported Spot, Box, DI, and DO ROI rows.
3. The poller/ingest process regularly reads camera status and ROI values.
4. The system stores and evaluates measurements in Celsius.
5. The Virtual Alarm runtime evaluates rules from fresh runtime values.
6. Rule filters run when conditions are true.
7. If nothing blocks activation, an incident can open or reactivate, and enabled

actions are queued as an action job.

1. The action worker processes queued actions asynchronously; snapshot actions

create snapshot jobs that the snapshot worker then processes.

1. The operator sees runtime effects on Incidents, Health, Snapshots, and

Visualization.

1. If investigation is needed, an admin or operator creates a ticket that a

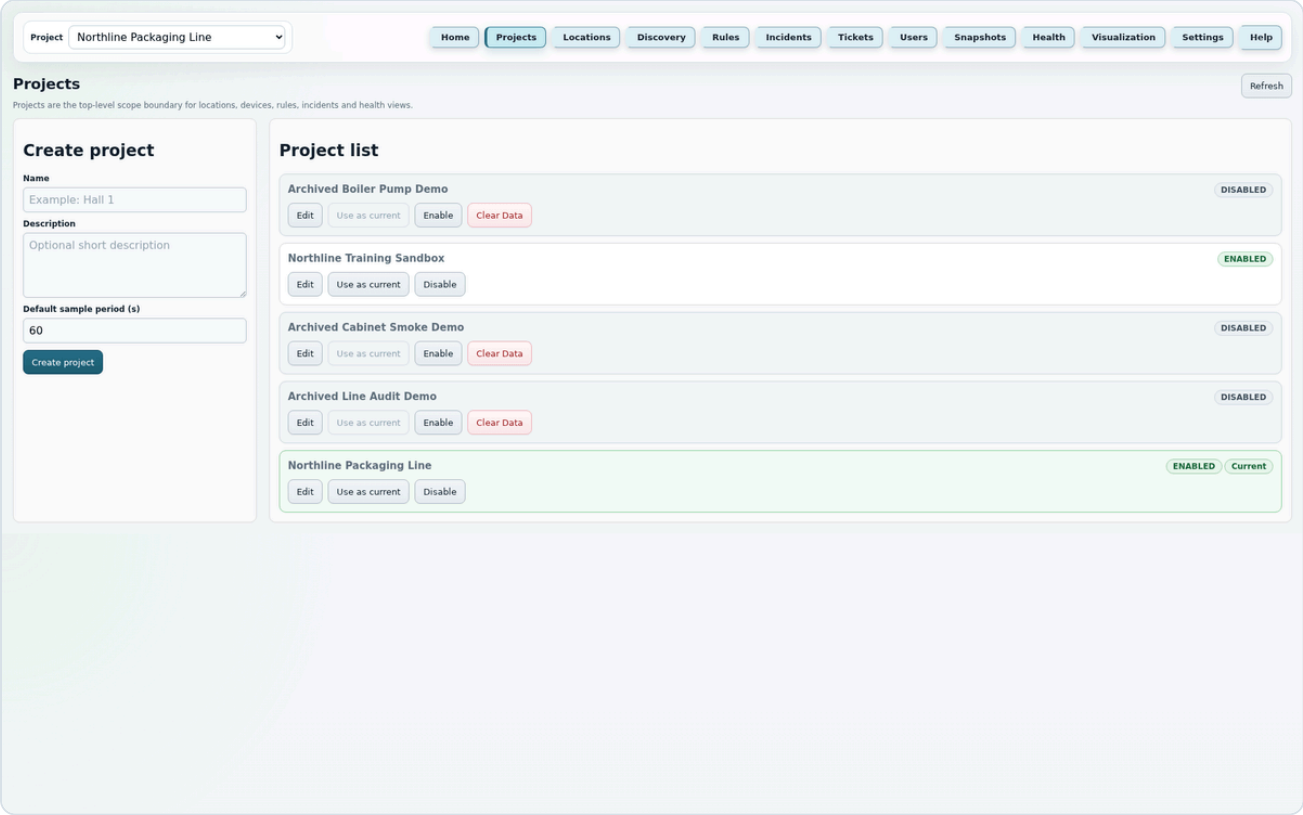
technician works on.

Projects, Locations, And Devices

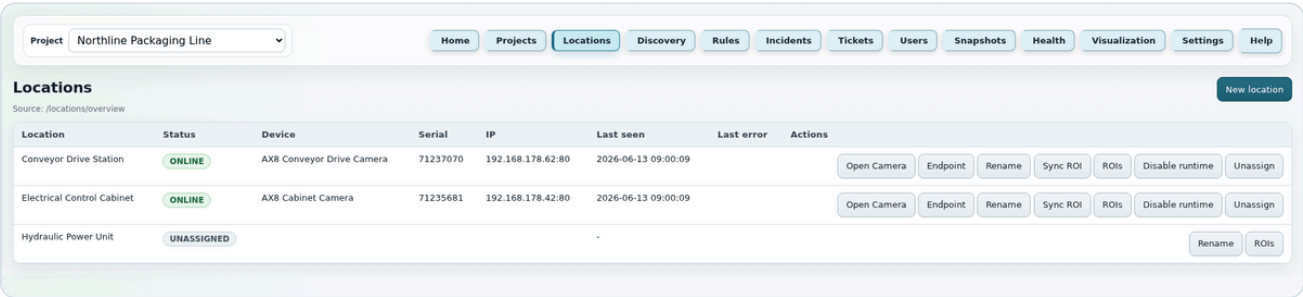
`Project` is the most important scope boundary in the system. A typical project can be a hall, boiler room, production line, or whole site. The project name is shown in lists, reports, and the top project selector.

The project default sample period is the fallback write cadence. It applies when there is no more specific location- or ROI-level setting. Project report fields such as customer/company, department, site/plant, logo URL, timezone, and footer text are edited on the Settings page.

The Locations page shows location/device relationships, online/offline state, last poll/last seen data, device errors, and the ROI panel for a location. Runtime disable keeps the assignment but makes the poller skip that deployment until it is enabled again.



Projects page in JC Thermal Monitor



Locations and camera assignments in JC Thermal Monitor

AX8 Camera, ROI Sync, And Measurement Settings

The current live adapter in Thermal Monitor is built for FLIR AX8 cameras. Supported ROI families are Spot, Box, DI, and DO. Line ROI support is intentionally left for a later adapter pass.

ROI sync refreshes local ROI rows from the current camera ROI list. The system tries to preserve local operator settings:

- short ROI name;
- longer ROI description;
- ROI enabled/disabled state;
- history storage enabled state;
- ROI-level `Store every (s)` sampling override;
- camera-side presence status.

Missing camera ROIs are not deleted automatically. Instead they remain in a `not present` / missing-like state so they can be handled after an operator decision.

Measurement data is stored and evaluated in Celsius. In the UI, values can be displayed in Celsius or Fahrenheit according to the global display unit. A key difference is that absolute temperatures and delta/hysteresis values use different Fahrenheit display conversions: absolute values use the normal `C <-> F` formula, while delta-like values use only the scale ratio.

History Data And Visualization Principles

The poller/ingest process regularly reads:

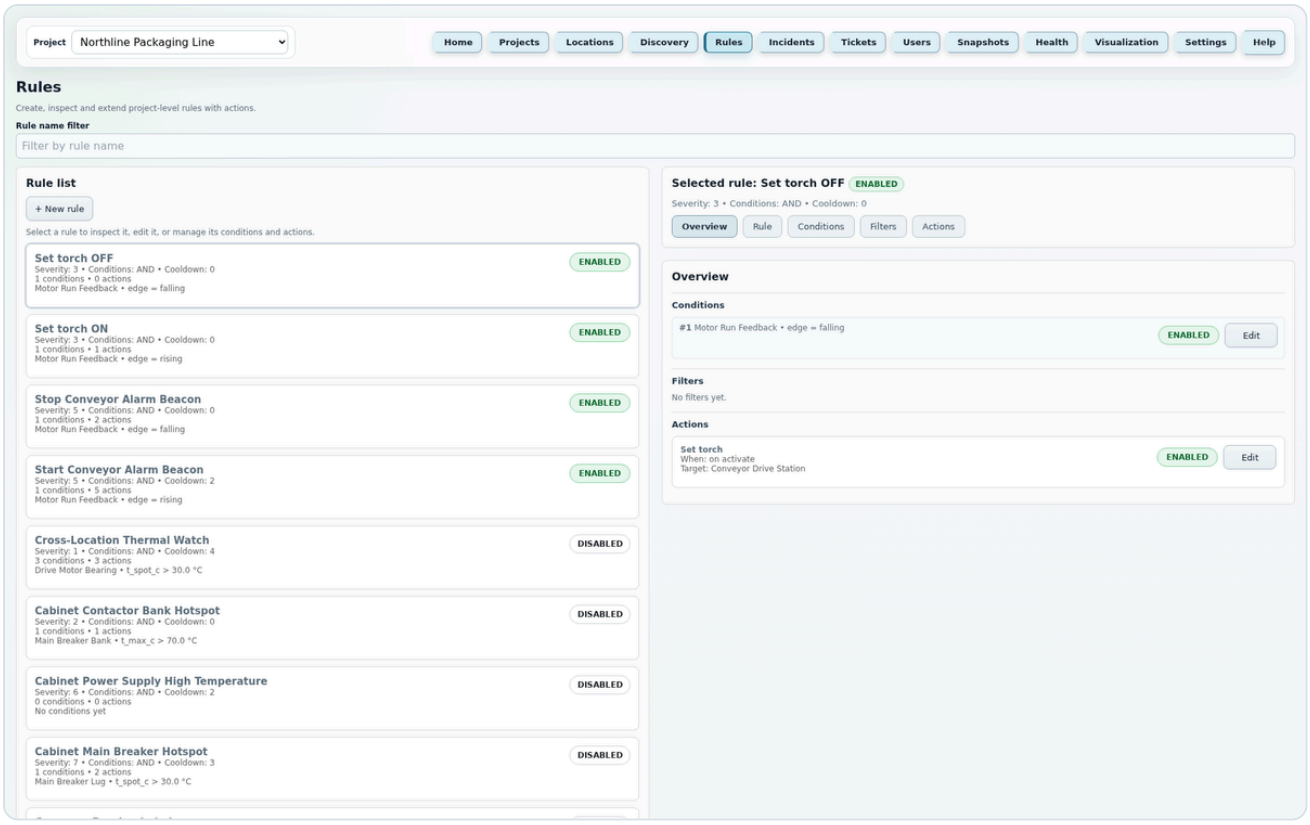
- camera online/offline and device status data;
- Spot/Box thermal ROI values;
- Digital Input and Digital Output states;
- camera measurement cache and Modbus runtime diagnostics.

The Visualization page builds time-series charts and a digital timeline from stored measurements. `measurement_ingest_interval_s` defines the base rhythm of the runtime sampling loop, while project/location/ROI sampling settings define how often values are written to history storage.

For digital history it is especially important that later display depends on observed or recorded edge events. If a very short impulse is shorter than the sampling cadence, it may not be visible later in history.

Virtual Alarm Summary

The Rules page is the Virtual Alarm configuration surface for the selected project. A rule can contain multiple conditions, multiple filters, and multiple actions. The Rules page is a configuration editor; runtime results are mainly seen on Incidents, Health, and Snapshots.



Virtual Alarm rules page in JC Thermal Monitor

Rule metadata:

- name;
- severity `1..10`, copied to a new incident when the incident opens;
- `all` / `any` condition logic;
- `cooldown_s`;
- enabled/disabled state.

Supported main condition types:

- direct-value analog temperature thresholds;
- delta conditions on the absolute difference between two ROIs, or one ROI and

a fixed temperature;

- temperature-rate conditions based on live ingest samples;
- digital state monitoring;
- rising/falling edge conditions;
- per-condition `threshold_time_s`;
- analog hysteresis where the metric supports it;
- for digital state, hysteresis is disabled/fixed to `0`.

The V1 temperature-rate condition uses live ingest samples, not database history. The current V1 behavior uses fixed `>=` logic with no hysteresis and no threshold time.

Rule Filters

Filters run when the rule conditions are already true. If an enabled filter blocks, no incident opens and no action runs.

Current V1 filter scope:

- schedule filter with weekday and local From/To time windows;
- previous incident window filter based on recent incident activity of another

rule;

- count window filter for repeated false-to-true activations.

In V1, one filter of each type can exist under a rule. The order is fixed: schedule, previous incident window, count window. Enabled filters use AND logic.

Rule Actions

Supported action types:

- `create_event`;
- `set_output`;
- `set_impulse`;
- `stop_impulse`;
- `set_torch`;
- `snapshot`;
- `email`.

Action execution is queued by the poller and performed by the action worker. The execution order inside an action job is deterministic: `create_event`, `set_output`, `set_impulse`, `stop_impulse`, `set_torch`, `snapshot`, then `email`. When `set_torch` follows a successfully started `set_impulse` in the same action run, the worker waits 500 ms before the camera web API call. If the worker reaches the end of the job but one or more actions record `write_error` or `resolve_error`, the job is marked `done_with_errors` so Health and runtime diagnostics do not hide the failed action.

AX8 practical recommendation: for short 2-3 second DO impulses, do not place `set_impulse` and `set_torch` in the same rule action list when they target the same camera. Torch control uses the camera web API, and concurrent load on the same AX8 can disturb the timing of short Modbus DO impulses. If the same alarm logic needs both impulse and Torch control, use two separate rules with identical or appropriately parallel conditions: one rule action list contains `set_impulse`, and the other rule action list contains `set_torch`. Both rules may still contain other non-conflicting actions.

Important details:

- `set_output` is used for level-style DO output control;
- `set_impulse` starts one or more timed pulses on a signal/impulse DO;
- `stop_impulse` shortens a running impulse sequence without a direct output

write;

- `set_torch` controls the LED lamp of the selected location camera through the

camera web API;

- `snapshot` queues a database-backed job and does not block the rule evaluator

inline;

- the action editor `Trigger mode` field narrows the available values according

to the action type;

- V1 `email` actions are supported on `on_activate`, with a `Recipients` list

and subject/body templates;

- rule emails can receive an automatic alarm detail block with location, camera,

condition, ROI, and action details when frozen trigger evidence is available;

- SMTP failure is recorded as a runtime action error but does not stop other

actions and no longer blocks the live measurement ingest loop.

Incidents And Evidence

Incidents represent the operator side of the alarm process. When a rule activation opens or reactivates an incident, the system can freeze trigger-time evidence:

- trigger-time condition results;
- relevant ROI values;
- rule/action context;
- lifecycle and runtime diagnostic information;
- later linked annotated snapshot evidence.

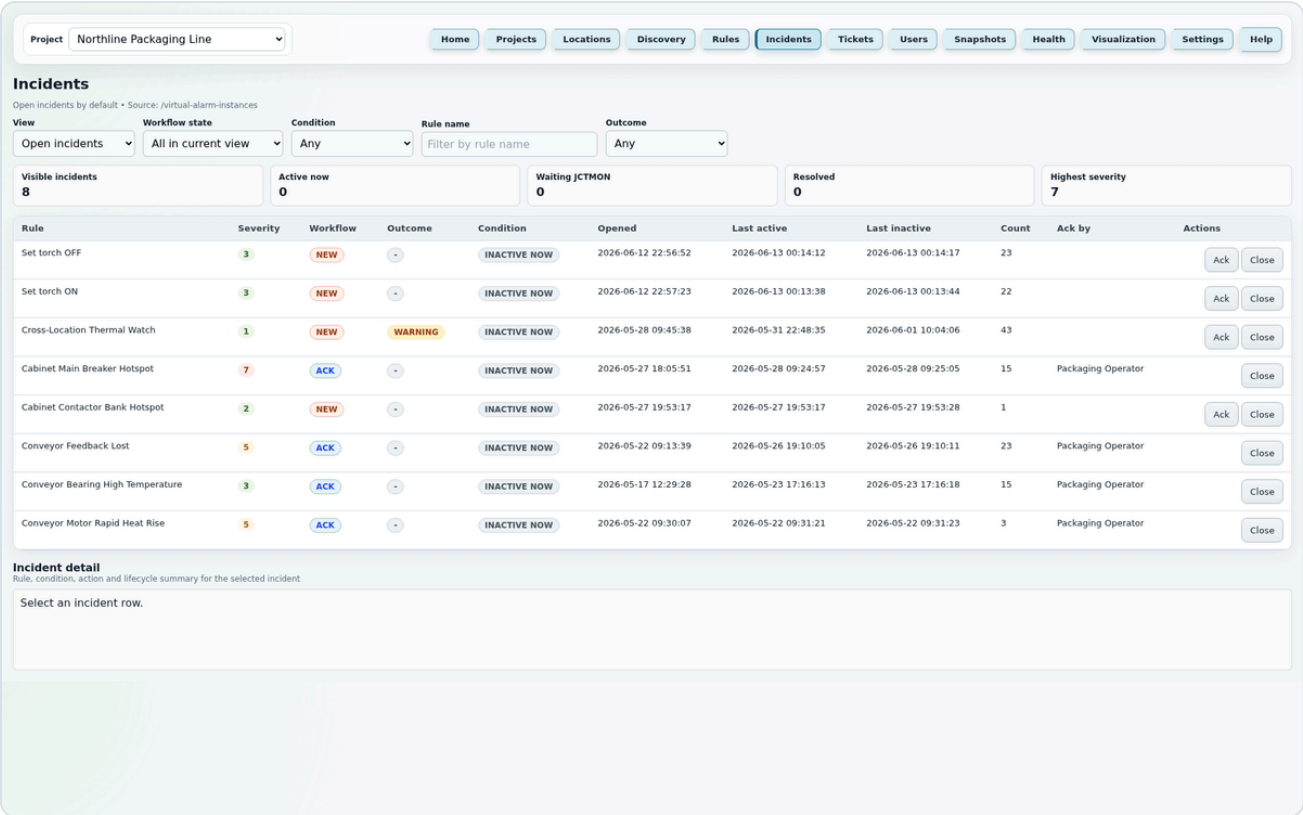
An incident is not closed automatically when the condition clears. Deactivation sets the runtime condition state to inactive, but the incident remains visible in the operator workflow until it is handled manually.

The Incidents page handles:

- open and closed/historical incident lists;
- filtering by workflow state and condition state;
- an outcome field separate from workflow state;
- free-text incident summary;
- ack and close actions;
- lifecycle and action result events;
- runtime states: pending, cooldown, incomplete, error, filtered;
- linked snapshot evidence links;

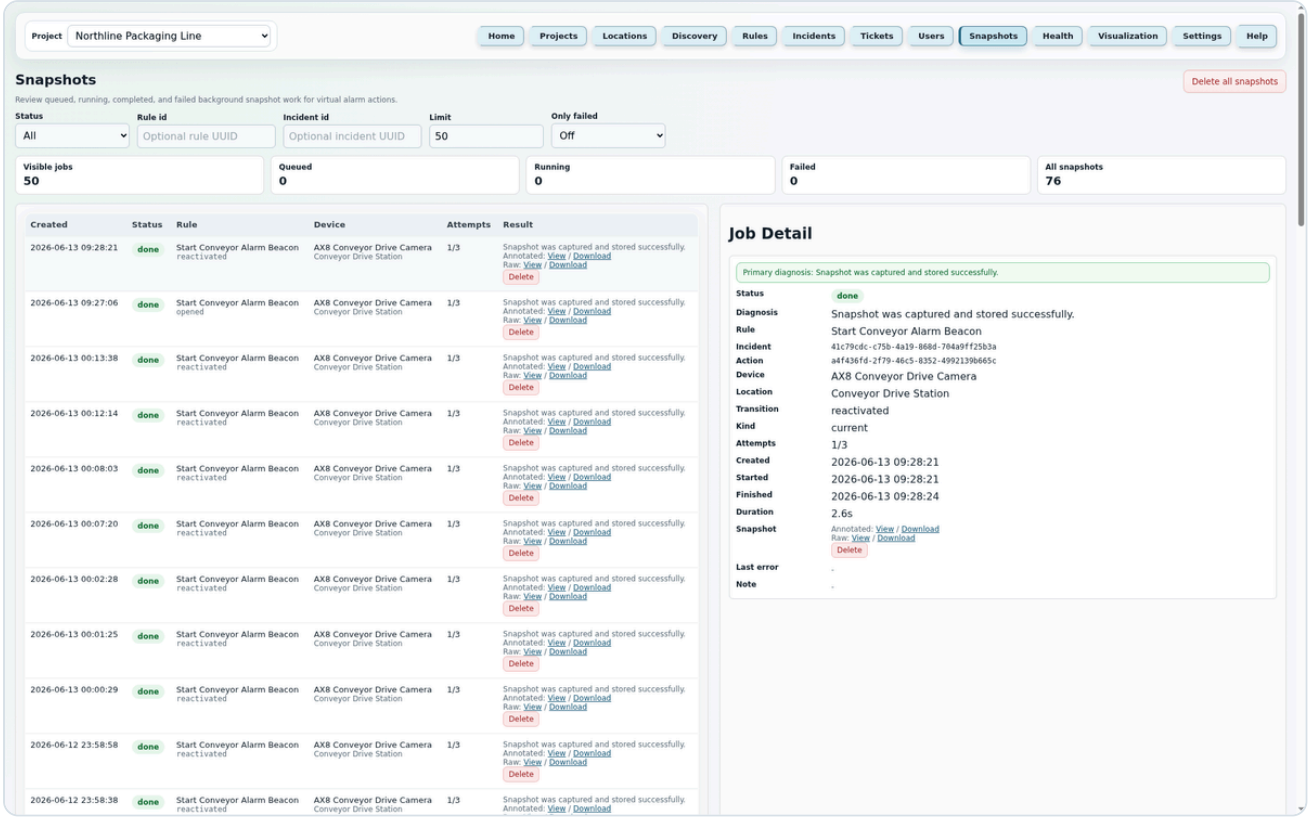
- ticket creation from an incident.

Action result rows can include output write, impulse revert, impulse stop, snapshot, email sent/dry-run, skipped, and runtime error states.



Incident workflow and trigger evidence in JC Thermal Monitor

Snapshot And Evidence Images



Snapshot job detail in JC Thermal Monitor

The system handles both manual snapshots and snapshots triggered by rules. A rule snapshot action does not capture the image directly; it creates a database job processed by the snapshot worker. This matters because camera capture can be slow or faulty and must not block the rule evaluator or poller.

Current snapshot behavior:

- manual snapshots can be requested from the application;
- rule snapshot action: DB-backed snapshot job;
- snapshot files are served through authenticated `/snapshots/files/...` paths;
- operator evidence links prefer the annotated snapshot;
- annotated overlay values are frozen from trigger-time runtime data;
- the image frame itself can be slightly later because capture is asynchronous;
- the Snapshots page shows queue, running, done, failed, and cleanup states;
- admin/operator users can delete jobs or snapshots when role and state allow it.

Snapshot capture can use REST/HTTP capture and RTSP fallback according to the configured timeouts. Stored operational images can contain production data, so they require special care during handoff and backup.

Ticket Workflow

The Incident Ticket feature is not a full CMMS system, but a targeted V1 investigation workflow. An admin or operator creates a ticket from an active incident, assigns it to a technician, and provides priority and work instructions.

When creating a ticket, these fields can be provided:

- ticket title;
- priority;
- assigned technician;
- work instruction;
- checklist task list;
- optional required measurement list.

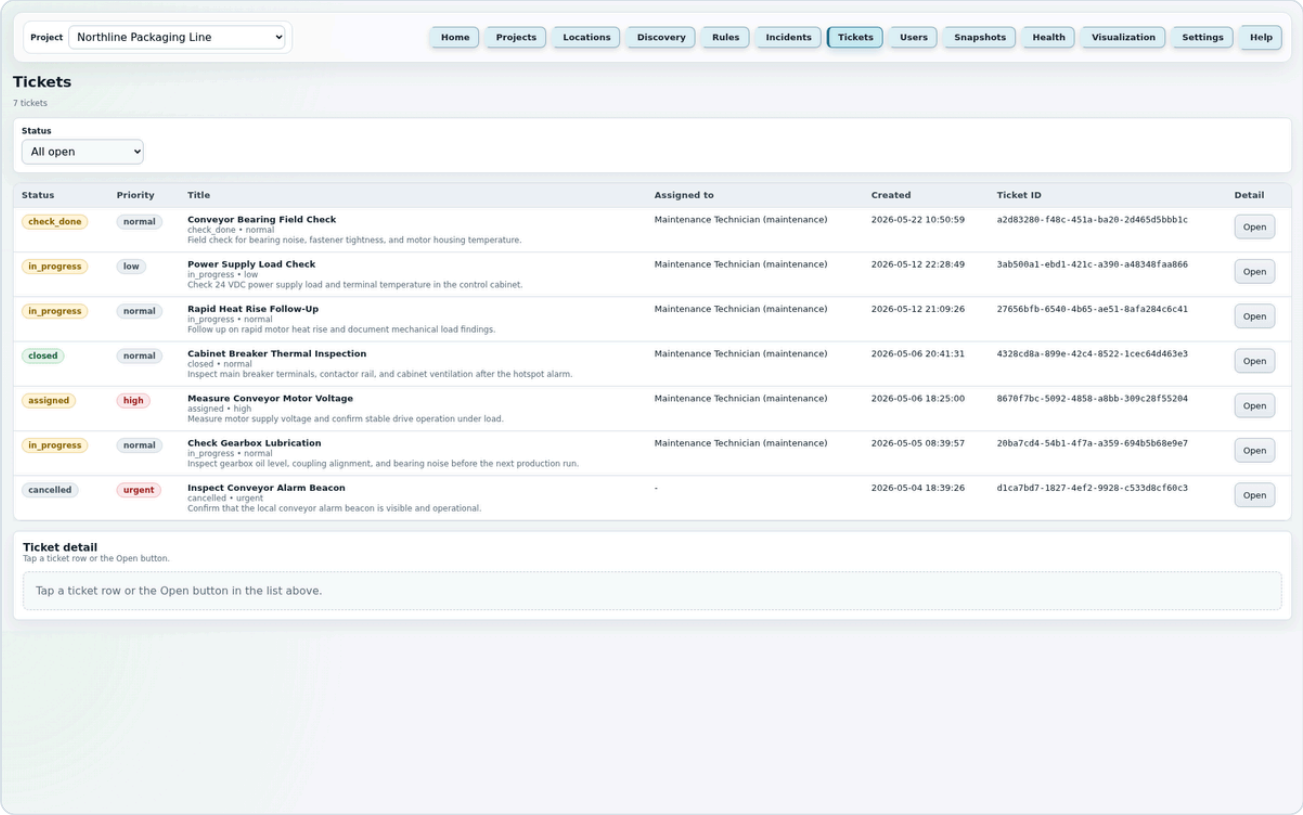
In V1, required measurement rows are created as checklist tasks with a `Measure:` prefix. On assigned tickets, a technician can:

- complete checklist tasks;
- write task result notes;
- save checklist measurement values;
- record extra manual measurement rows;
- add a general work note;
- upload JPG/JPEG/PNG/PDF attachment/evidence files.

Attachment limit: 20 MB. Files are stored on the filesystem with database metadata and are opened through controlled application links.

Main V1 statuses:

- `new`;
- `assigned`;
- `in_progress`;
- `check_done`;
- `repair_done`;
- `waiting_operator_review`;
- `closed`;
- `cancelled`.



Ticket workflow in JC Thermal Monitor

In operator review, an admin/operator can send the ticket back to the technician or close it. Closed and cancelled tickets are read-only in the UI and enforced as read-only by the application.

The Tickets page always filters to the project selected in the top project selector. There is no separate Tickets scope selector. Admin/operator users see tickets in the current project, while technicians see only their assigned tickets within the current project.

Ticket assignment email notification uses the shared notification service and follows the same enabled/dry-run SMTP configuration as rule email actions.

Permissions, Users, And Sessions

The system uses local user roles. Internal role names are:

- `admin`;
- `operator`;
- `maintenance`;
- `viewer`.

In UI text, the displayed name for the `maintenance` role is `Technician`.

Current roles:

- **admin**: user management, configuration, operator workflow, cleanup, and

supervisory actions;

- **operator**: operational project/device/rule/incident/ticket handling, ticket

review, and configuration tasks;

- **Technician / maintenance**: working assigned tickets, recording measurements,

notes, and evidence on own tickets; read-only access to diagnostic pages;

- **viewer**: logged-in monitor/kiosk role with Home and Visualization access.

Without login, only the minimal Home/Login view is available, with no operational data, Visualization, or snapshots. If no users exist yet, the system can provide an initial local admin account for commissioning.

Final permission decisions are enforced by the application even if the UI hides or disables buttons in a role-aware way.

The Users page is admin-only. Admins can create operator, technician, and viewer users, edit name/email/phone/role fields, reset passwords, manage active/inactive state, and remove only inactive test users that have no references. The last active admin is protected, and an admin cannot deactivate or remove itself.

Admin/operator/technician sessions can be logged out automatically after inactivity according to the timeout configured in Settings. Viewer sessions use a separate, longer viewer session lifetime.

Signal Output And Digital Outputs

DO ROIs can participate in `control` or `signal` style use. According to the current UI, Rules actions automatically drive the digital output mode: `set_output` means level/control use, while `set_impulse` and `stop_impulse` mean signal/impulse use.

`set_impulse` starts one or more impulses:

- the active state can be `on` or `off`;
- the impulse duration can be configured;
- the pause between pulses can be configured;
- the pulse count can be configured;
- the signal worker advances runtime state and final revert.

`stop_impulse` shortens the running impulse sequence on the same signal DO target so it finishes after at most one more pulse. It is not a direct output write action.

Current MVP limit:

- current target support is limited to DO ROI index `1`;
- live site validation and more detailed incident-facing diagnostics can be

refined later.

On the Health page, impulse runtime, output state, pending impulse, last error, and diagnostics for physical camera impulse write attempts and redundant/failed writes are

visible.

Detailed UI Page Descriptions

Pages follow the top project selector and the logged-in user role. Many pages refresh automatically according to the shared UI refresh setting, but refresh can pause while a field is being edited or a tooltip is active so user work is not overwritten.

Home Page

Home is the operator landing view. After login it summarizes the selected project state, camera connectivity, active incidents, recent alarm activity, latest snapshots, and the most important health warnings.

Login and password:

- login/logout and own password change happen on Home;
- during commissioning, an initial local admin account can be created if no

users exist yet;

- after successful login the UI reloads so menu and permissions match the logged

in role;

- with `must_change_password=true`, the system warns but in V1 does not block

authorized work;

- after logout, the UI returns to the minimal Home/Login view;
- without login, project dashboard, snapshot, camera, incident, or health data

are not loaded.

Dashboard content:

- summary cards show project-scoped values: active incidents, device status,

recent activity, snapshots, and health attention items;

- Top Health Warnings brings worker, device, ROI, rule, action, and runtime

warnings forward;

- Latest Snapshots links to the newest stored snapshot files, or falls back to

the Snapshots page;

- Home numbers always belong to the current project from the top project

selector.

For viewer users, Home is a monitor/kiosk overview. Anonymous users only see the login surface and no operational data.

Projects Page

The Projects page is used to create and manage project scopes. A project is the top-level boundary for locations, devices, rules, incidents, tickets, health views, and sampling settings.

Create project:

- `Name` is required and appears as the operator-facing name in selectors, lists,

reports, and project-scoped pages;

- `Description` is optional text explaining the site, line, or monitoring scope;
- `Default sample period (s)` is the fallback measurement write cadence when no

location- or ROI-level override exists;

- project names must be unique when creating and renaming projects.

Project list and actions:

- `Refresh` reloads the list without changing data;
- `Edit` opens the selected project detail panel;
- only one project detail panel is open at a time;
- `Use as current` sets the current project in the top project selector;
- `Enable` returns a disabled project to active lists and runtime eligibility;
- `Disable` keeps the data but excludes the project from active runtime polling

and normal active-project views;

- `Clear Data` is admin-only, available only for disabled projects, and removes

runtime data while keeping configuration;

- `Delete` appears only after Clear Data, on disabled projects with no runtime

data, and deletes the remaining project configuration.

Important: the top project selector lists only enabled projects. Disabled projects can be managed on the Projects page. `Clear Data` removes measurements, incidents, tickets, snapshots, snapshot files, ticket attachment files, exports, events, and runtime status rows, but keeps location, device, rule, camera assignment, user, and settings configuration.

Locations Page

The Locations page is the main management surface for locations, device assignments, and ROI settings. It shows which camera belongs to which location, what the online/offline state is, and opens the detailed ROI panel.

Main table:

- `Location` is the deployment or monitoring place inside a project;
- `Status` shows ONLINE, OFFLINE, RUNTIME DISABLED, or UNASSIGNED;
- `Device`, `Serial`, `IP`, `Last seen`, and `Last error` help verify the

assigned camera state;

- the camera web link can open the camera's own web interface;
- `ROIs` opens the detailed ROI panel;
- `Disable runtime` keeps the device assignment but makes the poller skip it

temporarily;

- `Enable runtime` brings the deployment back into polling;
- `Unassign` removes the active device assignment from the location.

Endpoint dialog:

- `Endpoint` opens the active camera endpoint settings for the selected row,

not a global app setting;

- `Device name` and `Serial number` identify the camera; the serial number

belongs to the physical AX8 camera even when the location changes;

- `IP address`, `HTTP port`, and `Modbus port` are the current camera access

settings;

- `Username` and `Password` are the camera web/auth credentials; the password

is entered from the app UI, stored encrypted, and the UI never displays an already saved password again;

- `Clear password` is a separate confirmed action that removes only the stored

camera password; normal `Save` cannot accidentally clear the password;

- the password status badge indicates whether a usable saved password is

available with the current credential key: `Password: configured` or `Password: not configured`;

- `Test torch` uses the saved username/password to turn the camera LED/Torch on

for 5 seconds and then automatically turns it off again;

- `Open Camera` still opens the camera's own web UI for manual login and does

not auto-login with the app-stored password.

ROI panel:

- `Sync ROI` refreshes the ROI list from the camera;
- `Save all` saves all edited ROI rows;
- `Save` saves only one ROI row;
- `Camera ROI` shows the camera label, type, and index;

- `Short name` is an operator-friendly display name, falling back to the camera

label when empty;

- `Description` is a longer local explanation or note;
- `Camera status` indicates whether the ROI actually exists on the camera;
- `ROI enabled` controls whether the ROI participates in runtime use;
- `History enabled` controls whether measurements are written to history;
- `Store every (s)` is an ROI-level storage cadence override.

Digital output use:

- DO mode is driven automatically by Rules actions;
- `set_output` means level-style use;
- `set_impulse` and `stop_impulse` mean impulse/signal use;
- the application can block automatic mode changes if an active action or

running impulse runtime would make the change risky;

- currently only DO ROI index `1` is supported as a target.

Discovery Page

The Discovery page uses network scanning to help find reachable devices and assign them to existing, still unassigned locations.

Scan inputs:

- `CIDR` scans a network such as `192.168.178.0/24`;
- `From IP` and `To IP` define a smaller explicit range;
- CIDR and From/To should not be used at the same time;
- `Ports` is a comma-separated TCP port list, for example `80`, `554`, `502`;
- `Timeout (ms)` is the wait time for one host probe;
- `Max results` limits the returned result table size, not the scan range

itself;

- internal safety limits protect scanning from unexpectedly huge ranges.

Assignment:

- the `Unassigned location` dropdown shows only locations without assignment;
- unknown-device assignment requires the camera serial number;
- camera login metadata is managed later from Locations -> `Endpoint`;
- `Assign` can appear on unknown devices and known devices that are not

currently assigned;

- after successful assignment the page scans again so Known state and buttons

refresh;

- new assignments are runtime-enabled by default.

A successful assignment registers or links the device to the selected location, but ROI rows only appear later after ROI sync on the Locations page.

Rules Page

The Rules page is the Virtual Alarm configuration editor. It is not the main runtime monitoring page; activations, clears, action results, filter blocking, and runtime diagnostics should be monitored on Incidents, Health, and Snapshots.

Overview:

- the rule list belongs to the selected project;
- the rule name filter narrows the list;
- after selecting a rule, workspace tabs are Overview, Rule, Conditions,

Filters, and Actions;

- when building a new rule, it is best to follow the Rule, Conditions, Filters,

Actions order;

- Overview gives a compact summary of conditions, filters, and actions.

Rule metadata:

- `Name` is required;
- `Severity` is `1..10`, where 10 is highest, and is copied to the incident on

new incident activation;

- `Conditions logic` is AND or OR;
- `Cooldown (s)` is the wait after clear/deactivation before the rule can

activate again;

- ENABLED/DISABLED toggles the rule without deleting it;
- Delete removes the rule after confirmation.

Conditions:

- direct-value, Delta, Temperature rate, and edge-based ROI conditions are

supported;

- ROI dropdowns group by location and order ROIs as Spot, Box, DI, DO;
- Delta calculates an absolute difference:

`abs(measured ROI - compare source)`;

- Delta works only on numeric temperature metrics;

- Temperature rate uses live ingest samples, not DB history;
- digital state conditions do not use hysteresis;
- edge conditions are sample-based, so a very short pulse can be missed if it is

shorter than the ingest cadence;

- in Fahrenheit display mode, absolute temperature and delta/hysteresis

conversions differ.

Filters:

- filters run after true conditions;
- V1 has schedule, previous incident window, and count window filters;
- one filter of each type can exist per rule;
- order: schedule, previous incident window, count window;
- enabled filters block with AND logic;
- runtime details for blocked activations are visible on the Incidents page.

Actions:

- supported types: `create_event`, `email`, `set_output`, `snapshot`,

`set_torch`, `set_impulse`, `stop_impulse`;

- execution is queued on incident transitions and processed by the action

worker; order inside the job is automatic: `create_event`, `set_output`, `set_impulse`, `stop_impulse`, `set_torch`, `snapshot`, then `email`;

- the action list is not a selection control; row buttons handle enable/disable,

edit, and delete;

- `Trigger mode` defines when an action runs, but the available modes are

narrowed by the selected action type;

- snapshot runtime results are checked on Snapshots and Incidents;
- email actions use `on_activate`, addresses from `Recipients`, template

subject/body, and the configured SMTP service;

- email runtime result appears as sent/dry-run/error diagnostics.

Incidents Page

The Incidents page shows live and historical incidents created by Virtual Alarm rules. It includes runtime diagnostics, action results, lifecycle history, trigger evidence, and the ticket workflow that can be started from an incident.

Filters and list:

- the page follows the current project from the global project selector;
- `View` switches between the open view and closed/history view;
- `Workflow state` filters by lifecycle state;
- `Condition` filters by active/inactive condition state;
- `Rule name` filters by rule text;
- `Outcome` filters by investigation classification;
- list columns: Rule, Severity, Workflow, Outcome, Condition, Opened,

Last active, Last inactive, Count, Ack by;

- `Ack` records operator takeover;
- `Close` closes the incident when the workflow allows it.

Detail panel:

- `Status` changes workflow state;
- `Outcome` stores the investigation result separately from workflow state;
- `Changed by` records the operator name;
- `Note` is a short workflow note;
- `Incident summary` is a longer human summary of what happened, what was

checked, what the result was, and what follow-up is needed;

- workflow status, outcome, and summary can autosave without a separate Save

button;

- condition list, action result, lifecycle events, and latest runtime diagnosis

are visible.

Ticket creation from an incident:

- admin/operator users can create a ticket from an active incident;
- assignment to an active technician is required;
- title, priority, work instruction, checklist tasks, and optional required

measurements can be entered;

- assigned users are shown by name/display name, with UUID only as fallback;
- ticket status changes are finalized on the Tickets page according to

role-aware rules.

Runtime states:

- `Pending`: threshold timing is still in progress;
- `Cooldown`: activation is temporarily blocked;
- `Incomplete`: missing or stale data;

- `Error`: rule evaluation error;
- `Filtered`: a filter blocked incident and actions despite true conditions;
- linked snapshot image time can be later than the trigger because capture is

asynchronous.

Tickets Page

The Tickets page manages investigation worksheets linked to incidents. A ticket is not a full CMMS entity, but a focused V1 work item for measurement, inspection, documentation, or repair follow-up.

Role behavior:

- the page uses the Home login current user;
- admin can oversee the workflow;
- operator writes work instructions, assigns a technician user, defines tasks,

reviews, closes, or cancels tickets;

- technician works on its own assigned tickets;
- the Status change block shows only the next statuses allowed by the logged-in

user, ticket state, and assignment.

List:

- always filters to the current project from the top project selector;
- there is no separate scope selector;
- status filter works inside the current project;
- `All open` hides closed and cancelled tickets;
- list columns: Status, Priority, Title, Assigned to, Created, Ticket ID;
- auto-refresh follows the shared UI refresh setting.

Detail workflow:

- header shows title, status, priority, assigned technician, incident id,

printable report link, and ticket id;

- `Assign technician` assigns or reassigns to an active technician;
- `Status change` shows role-aware next statuses;
- the technician reads the work instruction before changing the ticket;
- `General work note` is for separate observations, findings, and

recommendations;

- checklist task done checkbox and task result/note can be used;
- for checklist measurement tasks, Value, Unit, and Save measurement store the

requested reading directly on that task;

- `Additional measurements` are for extra measurements that were not requested

in advance;

- attachment/evidence can be JPG, JPEG, PNG, or PDF, with a 20 MB limit;
- Entries shows status change, note, measurement, and attachment events as an

audit trail.

Operator review:

- in `waiting_operator_review`, admin/operator users see a separate review

panel;

- Send back to technician requires a review note;
- Close ticket requires a review note or close note;
- closed and cancelled tickets are enforced as read-only by the application.

Snapshots Page

The Snapshots page shows snapshot jobs originating from Virtual Alarm actions and manual/API actions. It is used to inspect queue state, worker progress, stored files, annotated evidence, and cleanup results.

Header and filters:

- `Status` filters queued, running, done, failed, or all jobs;
- `Rule id` narrows the list to jobs for one rule UUID;
- `Incident id` narrows the list to jobs for one incident UUID;
- `Limit` controls how many newest rows are loaded, from 1 to 200;
- `Only failed` is failed-job troubleshooting mode;
- the list follows the current project from the top project selector;
- `Delete all snapshots` appears only for the appropriate role and should be

used only when evidence is no longer needed.

Job list and detail:

- `Created` is job creation time;
- `Status` is worker state;
- `Rule` is the rule that requested the snapshot;
- `Device` is the camera/device source;
- `Attempts` is the number of worker attempts;
- `Result` shows file links, error details, or cleanup/delete controls;
- Job Detail can show started/finished times, duration, error text, snapshot

links, and trigger context.

Job state interpretation:

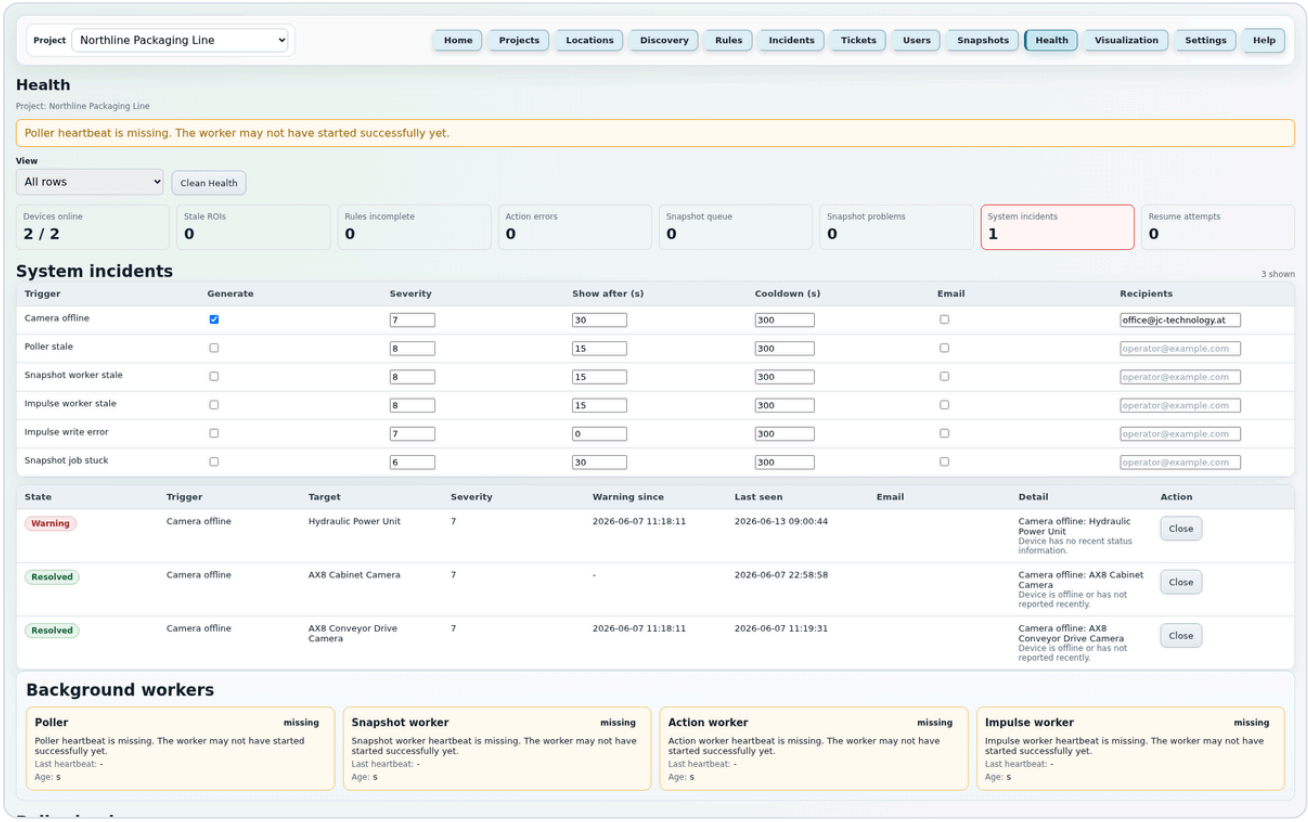
- `Queued`: waiting for the worker;
- `Running`: worker has claimed and is processing it;
- `Done`: image was captured and saved successfully;
- `Failed`: worker could not finish;
- `Kind=current`: a Rules-triggered snapshot used the camera's current image

mode;

- manual/API snapshots can show explicit `thermal`, `visual`, or `overlay` kind;
- annotated snapshot link appears when the evidence image is ready;
- overlay values are frozen from trigger-time runtime data.

Health Page

The Health page provides one operational diagnostic overview for the selected project: device connectivity, ROI freshness, rule runtime state, action diagnostics, impulse runtime, snapshot-job runtime, and worker heartbeat.



Operational Health page in JC Thermal Monitor

Toolbar:

- `View` switches between `All rows` and `Only attention needed`;
- `Only attention needed` hides healthy rows;
- `Clean Health` is an admin/operator action for deleting old health and runtime

diagnostic rows;

- `System incidents` can turn health warnings into visible Warning rows after

the configured `Show after (s)` delay;

- the page follows the global project selector.

Worker and poller sections:

- Background workers: fresh or stale heartbeat state for poller, action worker,

snapshot worker, and impulse worker;

- Poller load: ingest/status loop duration, actual interval, targets, OK count,

failed count, rows written, projects evaluated, and finish time.

Camera runtime sections:

- Camera Modbus Lock: wait, extended wait, timeout, long hold, unlock warning;
- Recent Camera Modbus Events: camera, operation, event type, wait time, hold

time, message;

- Camera Measurement Snapshot: health of the shared measurement cache and

refresh error count;

- Recent Camera Measurement Events: cache state, snapshot age, max accepted age,

message;

- Camera Impulse Writes: physical DO write attempts, skipped same-state writes,

and write errors;

- Image live started: the app sent an AX8 Image Live / resume video command

after detecting frozen video state.

Snapshot, impulse, and project state:

- Snapshot job runtime: backlog, running jobs, failed jobs, stale running jobs,

last success, last failure, last error;

- Impulse runtime: target output, health, current impulse, phase, pending

impulse, related incidents, output value, update time, last error;

- Impulse Churn Suppression: intentional suppression of repeated or already

active impulse activations;

- Devices: online/offline, last poll, last seen, age, latest error;
- ROI freshness: freshness of enabled ROI measurements;
- Rule runtime: condition state, incomplete reason, pending timing, last

evaluation, last error;

- Action diagnostics: action health, status, transition, last attempt, last

success, failure count, last error.

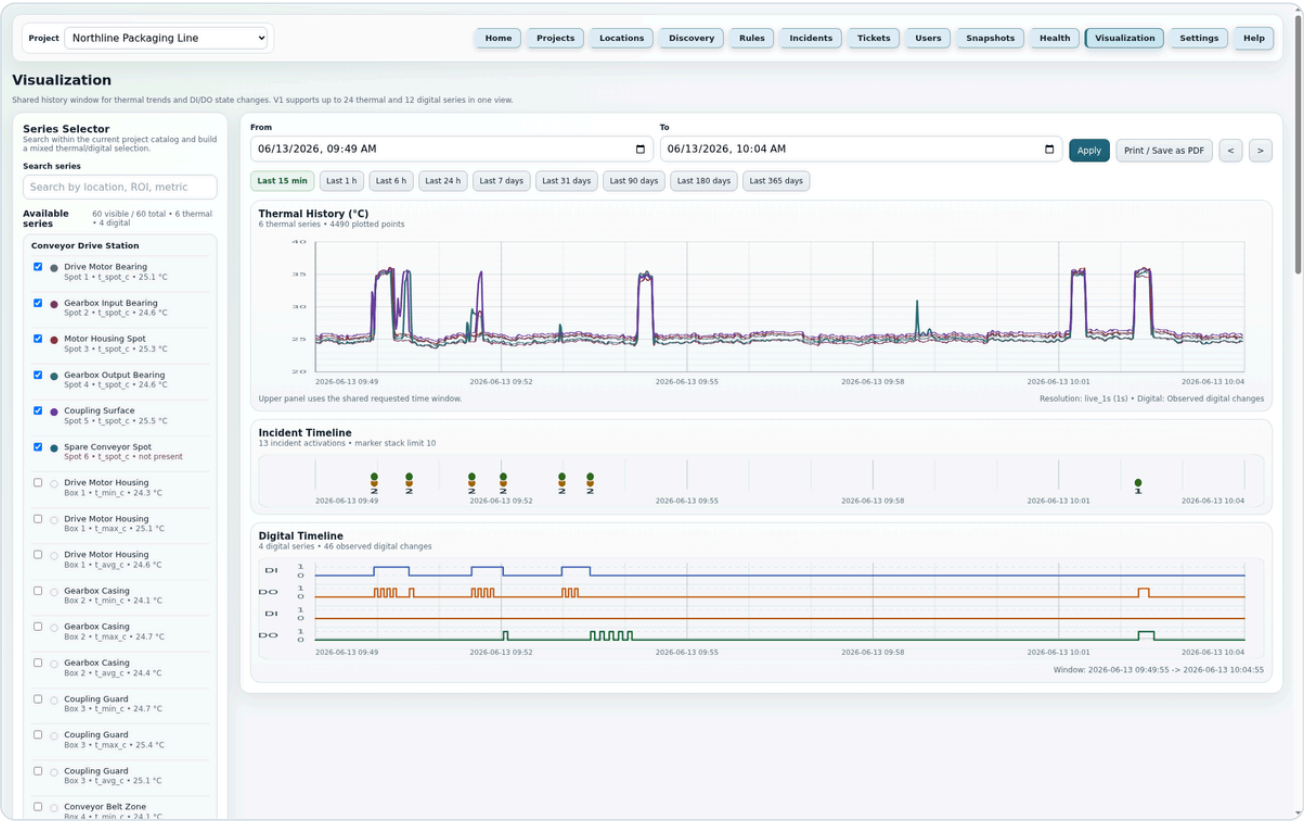
System incidents:

- selected Health problems can be raised to Warning rows;
- `Generate` enables the Warning row generated from that health trigger;
- `Severity` defines Warning priority;
- `Show after (s)` delays first appearance;
- `Cooldown (s)` controls when the same problem can reopen after Close;
- `Email` and `Recipients` configure optional email notification;
- Warning means the problem is still present;
- Resolved means it cleared but remains visible until operator Close;
- after Close, if the same problem is still present after cooldown, it can

appear again.

Visualization Page

The Visualization page provides a shared history view for thermal series and DI/DO state changes inside a selected time window.



Visualization page with thermal and digital history in JC Thermal Monitor

Series Selector:

- the left side contains project-scoped thermal and digital series grouped by

location;

- search filters by location, ROI, or metric text;
- checkbox adds or removes a series from the chart;
- the list can show latest runtime value hints;
- `stale` means the last measurement is old;
- `no value` means there is no usable current value;
- `not present` means the ROI is currently marked missing on the camera.

Time window:

- From/To defines a custom history window;
- Apply loads the selected series;
- `<` and `>` move backward or forward by one full window length;
- presets range from Last 15 min to Last 365 days;
- windows longer than 365 days are rejected;
- automatic refresh continues in the background but pauses while an edit field

or chart tooltip is actively open.

Charts:

- the upper thermal chart shows selected temperature metrics in the display

unit;

- the incident chart shows incident markers;
- the digital chart shows a step chart for short windows and bucketed activity

for longer windows;

- hover shows exact values or incident marker details;
- digital timeline lines, activity stems, and DI/DO row labels have wider hover

targets;

- double-click on any chart, including incident markers, opens a narrower custom

window around that timestamp.

Print / PDF:

- the button is enabled after data is loaded;
- the print window includes the Settings report header fields;
- selected series are grouped by location;
- charts, time range, and project timezone are included.

V1 limits:

- maximum 24 thermal series;
- maximum 12 digital series;
- windows longer than 6 hours use a simple aggregated thermal view;
- up to 15 minutes: digital step chart; longer windows: bucketed digital

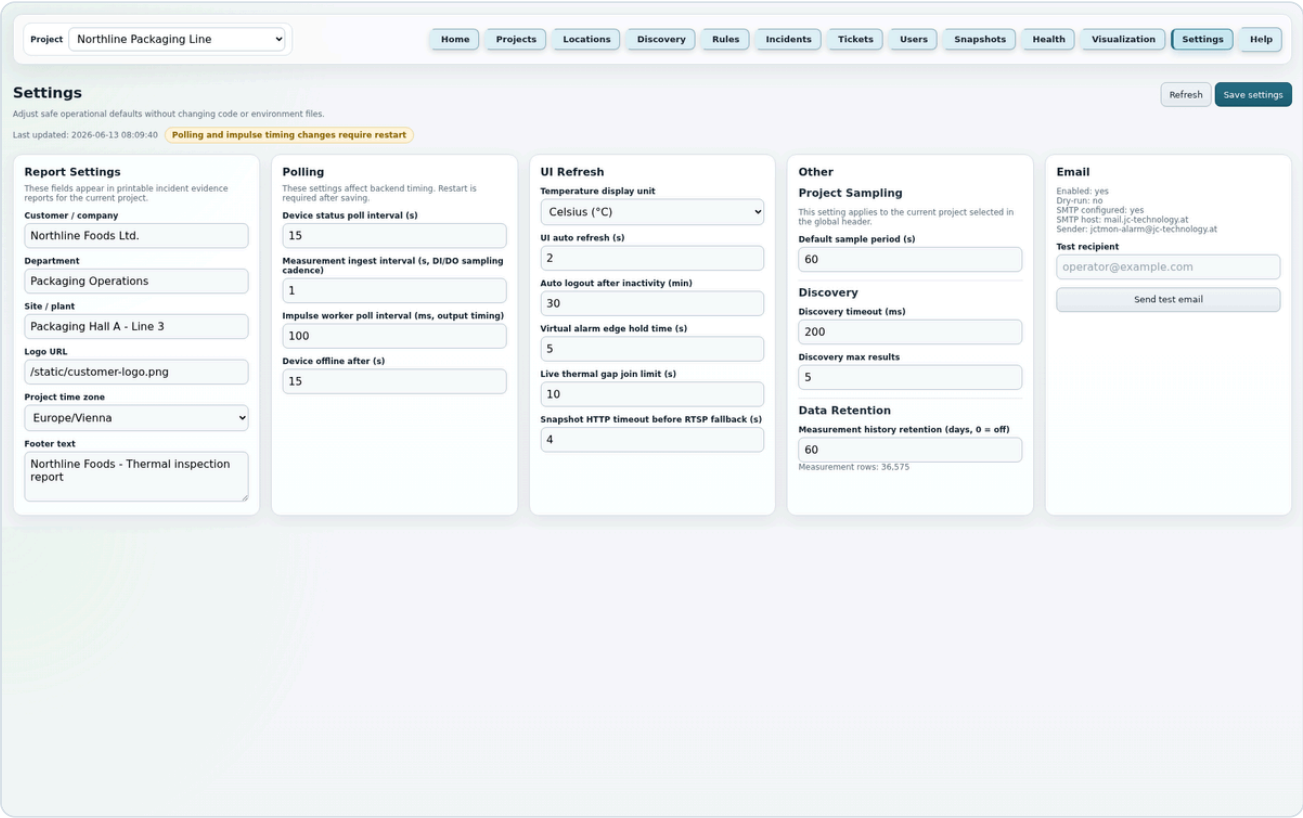
activity;

- digital history can be displayed later only if the edge event was observed or

recorded.

Settings Page

The Settings page manages operator-adjustable runtime defaults and project-specific report/sampling fields from the application UI.



Settings page in JC Thermal Monitor

Header actions:

- `Refresh` reloads application settings, current project sampling, project

report settings, email status, and a fresh recount for `Measurement rows`;

- `Save settings` is the single shared save action for global settings, current

project sampling, and project report settings;

- `Unsaved changes` appears next to the header actions after editing and clears

after Save or Refresh;

- `Last updated` shows the last load or save time;
- the restart note identifies settings read by long-running worker processes.

Project Sampling:

- `Default sample period (s)` applies to the current project;
- it is the fallback for future measurement writes when there is no location or

ROI override;

- it appears in the `Other` card and is saved by the shared `Save settings`

button.

Report Settings:

- Customer/company, Department, and Site/plant appear in printable incident

evidence reports and Visualization print output;

- Logo URL points to a report header image;
- Project time zone is used for UI/report timestamp formatting;
- Footer text appears at the bottom of generated reports;
- the shared `Save settings` button saves the current project's report fields.

Polling and runtime defaults:

- Device status poll interval: how often cameras are checked for online/offline

status;

- Measurement ingest interval: ROI and DI/DO runtime sampling cadence;
- Impulse worker poll interval: how often output impulse runtime advances;
- Device offline after: freshness window for offline status;
- Temperature display unit: UI formatting between Celsius/Fahrenheit, while

stored/API thermal values remain Celsius-based;

- UI auto refresh: shared refresh cadence for monitoring/workflow pages;
- Auto logout after inactivity: logs out inactive users;
- Virtual alarm edge hold time: short retention of edge-based condition evidence;
- Live thermal gap join limit: gap handling in the Last 15 min chart;
- Snapshot HTTP timeout before RTSP fallback: REST capture wait before fallback.

Other, data retention, and Email:

- Discovery timeout is the default per-host probe timeout;
- Discovery max results is the default result-table limit;

- `Measurement history retention (days, 0 = off)` controls how many days

automatically stored measurement history rows are kept;

- the `Measurement rows` status shows the current number of measurement rows;

the Settings `Refresh` button forces a recount, and the row value refreshes once per minute while the Settings page is open and there are no unsaved edits;

- retention value `0` disables automatic measurement history cleanup;
- when the retention value is saved, measurement cleanup runs immediately; the

app also checks at startup and once per day;

- tickets, rules, incidents, trigger evidence, and snapshots are not deleted by

this retention setting;

- the Email card shows whether notification is enabled, dry-run is active, and

non-secret SMTP fields are configured;

- Send test email uses the same notification service as ticket and rule email;
- in dry-run mode, email is logged but not sent through SMTP;
- SMTP server details are runtime configuration and can require a service

restart after changes.

Users Page

The Users page is an admin-only surface for managing operator, technician, and viewer accounts. Its purpose is to make local auth and role-based workflows manageable without direct database operations.

Create user:

- `Username` is the login name, unique and not later editable from the UI;
- `Display name` is the human-readable name shown in workflow screens and

assignment lists;

- `Temporary password` is the initial or reset password set by admin;
- `Role` controls permissions;
- `Email` and `Phone` are optional contact fields;
- `Create` creates an active user and requires password change after next login.

User list:

- `Refresh` reloads all users, including inactive users;
- Role shows the permission group;
- Status shows whether the user can log in;
- Password shows whether password change is required;

- Reset password sets a new temporary password;
- Deactivate prevents login but keeps ticket history references;
- Activate re-enables an inactive user;
- Edit changes only Name, Email, Phone, and Role;
- Remove appears only after deactivate and only if the user is not referenced

anywhere in the database.

Important rules:

- only logged-in admins can use the page;
- new and reset passwords require password change;
- users with ticket or workflow history are not removed, only deactivated;
- an admin cannot deactivate or remove itself;
- the last active admin cannot be deactivated or lose the admin role;
- inactive users cannot be used as role-based workflow actors.

Data, Evidence, And Security

Thermal Monitor stores configuration, measurement history, incidents, tickets, users, settings, and runtime diagnostics in a structured database. Snapshot images and ticket attachments are stored as controlled evidence files and opened through authenticated application links.

Security-relevant behavior:

- camera endpoint passwords are entered from the app UI and stored encrypted;
- the UI never displays an already saved camera password again;
- clearing a saved camera password is a separate confirmed Endpoint action;
- `Open Camera` opens the camera's own web interface and does not auto-login

with the app-stored password;

- snapshot files can contain operational images, so access is authenticated and

role-aware;

- destructive actions such as cleanup, delete, and configuration changes are

role-guarded;

- anonymous users get only the minimal Home/Login view;
- viewer users are intended for Home and Visualization monitoring.

Current Product Limits

Current product boundaries that are relevant for demos and customer discussions:

- current AX8 DO action target support is limited to DO ROI index `1`;

- Visualization has practical series and time-window limits to keep charts

readable and responsive;

- digital history can show only edges that were observed or recorded;
- the ticket workflow is focused on alarm investigation and evidence handling,

not on replacing a full CMMS system;

- required measurements in tickets are represented as checklist measurement

tasks;

- Line ROI support is not part of the current AX8 adapter;
- email sending depends on the configured SMTP environment and should be tested

for each deployment.