

Scheduler

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A formula is recalculated when a variable it reads changes. Some formulas read nothing that changes: the time, with `now()`, or a logger's history, whose variable is named as text. A SCHEDULER recalculates such formulas on a clock.

Module	What it does	Typical use
Scheduler (<code>SCHEDULER</code>)	Makes formula variables recalculate on their schedules	Averages and totals over history, clock variables, values that change with the time of day

The module also has the settings every module shares: whether it is enabled, its name, its status and message variables and their thresholds. They are described in [Settings every module shares](#).

Scheduler

Settings

Key	Setting	Type	Default	Meaning
<code>definitions</code>	Definitions	list of rows	empty	The variables to recalculate, each with its schedule

Definitions

Key	Setting	Type	Default	Meaning
<code>field</code>	Variable	variable code	empty	The variable to recalculate. It must have a formula
<code>cron</code>	CRON	Quartz cron	<code>0 * * * * ?</code> <code>* * ?</code>	When to recalculate it. A new row defaults to every minute (<code>0 * * * * ?</code>); the syntax is in Settings every module shares

One module can hold any number of definitions, and one variable can appear in several, each with its own schedule.

What a tick does

- **It asks for a recalculation, and nothing else.** A tick has the same effect as a change of a variable the formula reads: the formula runs, and its result is written into the variable. The Scheduler hands the variable no value of its own.
- **Only a formula is recalculated.** A tick on a variable without a formula does nothing: no value, no error, no message.
- **The result is written like any formula's.** It is converted to the variable's declared type and saved when the variable is persistent. A result equal to the value the variable holds changes nothing, and nothing that reads the variable runs; a different one runs everything that does, as any change would.
- **Formulas run one at a time.** The recalculation joins the engine's queue of formulas to recalculate, behind any already waiting. A tick that falls while the variable is still waiting adds nothing.
- **A formula that fails** keeps the variable's value and writes a warning to the log. The Scheduler's own status does not show it: the failure belongs to the variable.

- **Until the first tick** a variable whose formula reads nothing that changes holds its initial value, or no value at all when it has none. A persistent variable holds its saved value instead, and its initial value only when it has nothing saved, as at its first start: see [Initial values](#).
- **Renaming.** When an import renames variables, the definitions follow the rename.
- **Any case.** A definition finds its variable however the code is written: `lit_301_avg` recalculates `LIT_301_AVG`, since the engine keys every variable by its code in capital letters.

Schedules

Every definition's CRON is checked before any of them is scheduled: one that is empty or cannot be read keeps the whole module from opening, so no definition runs, and its status reads `Invalid schedule '{cron}': {reason}`, or `No schedule given` for an empty one. The module stays in error until the CRON is corrected and the engine started again. Schedules follow the plant's time zone, `application.timezone`, as formulas do (before engine 6.18.9, the Java process's zone), and a time that passed while the engine was stopped is not made up later: see [Schedules](#).

Messages

A Scheduler that opened is on, and says nothing else. The complete list is in [Module messages](#).

When	Level	Text
Opening: a definition has no CRON. The module does not open	ERROR	No schedule given
Opening: a CRON cannot be read. The module does not open	ERROR	Invalid schedule '{cron}': {reason}

Example

Two formula variables recalculated on a clock:

Variable	Formula	CRON
LIT_301_AVG_24H	<code>tsAverage(history(PLANT_LOG, "LIT_301", addHours(now(), -24), now()))</code>	<code>0 0/15 * * *</code> ?
CLOCK_UTC	<code>now()</code>	<code>* * * * *</code> ?

`LIT_301_AVG_24H` holds the level's average over the last 24 hours from the [LOGGER](#) `PLANT_LOG`, brought up to date every quarter of an hour. `CLOCK_UTC` changes every second, and every dashboard that shows it redraws with it. A third definition for `P101_RUN`, which a Modbus master writes and which has no formula, would do nothing at all.

Next steps

- [Logger](#)
- [Settings every module shares](#)
- [Module messages](#)
- [Module catalogue](#)

This page describes Data Orchestrator engine 6.18.9.