OMRON

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Features and System Configuration

2
Operating Procedure

A
Appendices

DX Series
Factory Monitoring Package

User's Manual

Precautions for Correct Use

If you are using the package, please make sure to update to the latest version of both the package and the DX1 unit.
You can obtain the package files from the license portal below and upload them to the Data Flow Controller to use the package.

https://license-user.automation.omron.com/

For detailed upload instructions, please refer to the dashboard generator manual, section "2-4 Installation Procedures for Non-Pre-installed Packages."
For details on updating the DX1 unit version, please contact your OMRON sales representative.

N702-E1-03

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Introduction

Thank you for purchasing our DX-series Data Flow Controller.
This manual provides information about the Factory Monitoring Package included with the DX Series Data Flow Controller.
Please read this manual and make sure that you understand the functionality and performance of the product before you attempt to use it in a control system.

Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (electrical engineers or the equivalent).

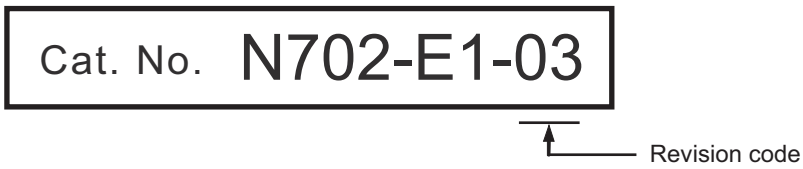
- Personnel in charge of designing and operating data utilization systems on a production site.
- Personnel in charge of designing and operating maintenance systems on a production site.

Guidance for Reading This Manual

For information on **Terms and Conditions Agreement**, **Precautions for Safe Use**, **Precautions for Correct Use**, and **Related Manuals**, refer to the *DX Series Data Flow Controller User's Manual (V241-E1)*.

Revision History

A manual revision code appears as a suffix to the catalog number on the front and back covers of the manual.



Revision code	Date	Revised content
01	October 2025	Original production
02	October 2025	Corrected mistakes
03	May 2026	Added chapter 2-3 Method for Outputting KPIs of the Factory Monitoring Package

Sections in this Manual

CONTENTS

1

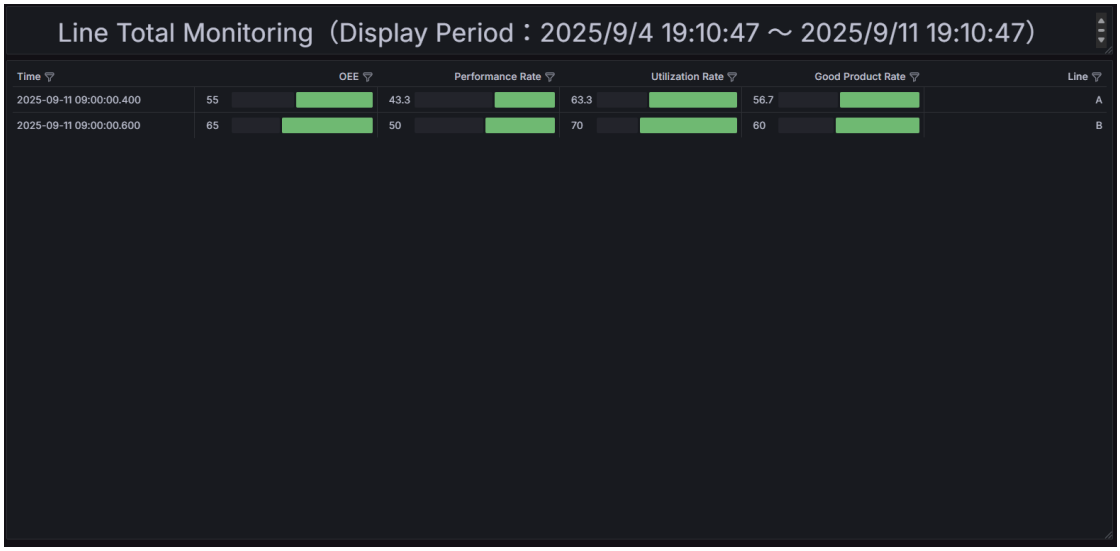
Features and System Configuration

This section describes the features and system configuration of the Factory Monitoring Package.

1-1 Capabilities of the Factory Monitoring Package

● Factory Monitoring Package

This package collects KPIs from multiple Data Flow Controllers registered with the equipment monitoring package, and aggregates and visualizes them by factory, production line, and process.
The collected KPIs include Overall Equipment Effectiveness (OEE), yield rate, performance availability, and time availability.
Information gathered by the equipment monitoring package is centrally managed by the Data Flow Controller.
This enables comprehensive monitoring of factory-wide and line-level conditions, and allows data to be organized according to the required level of management granularity.

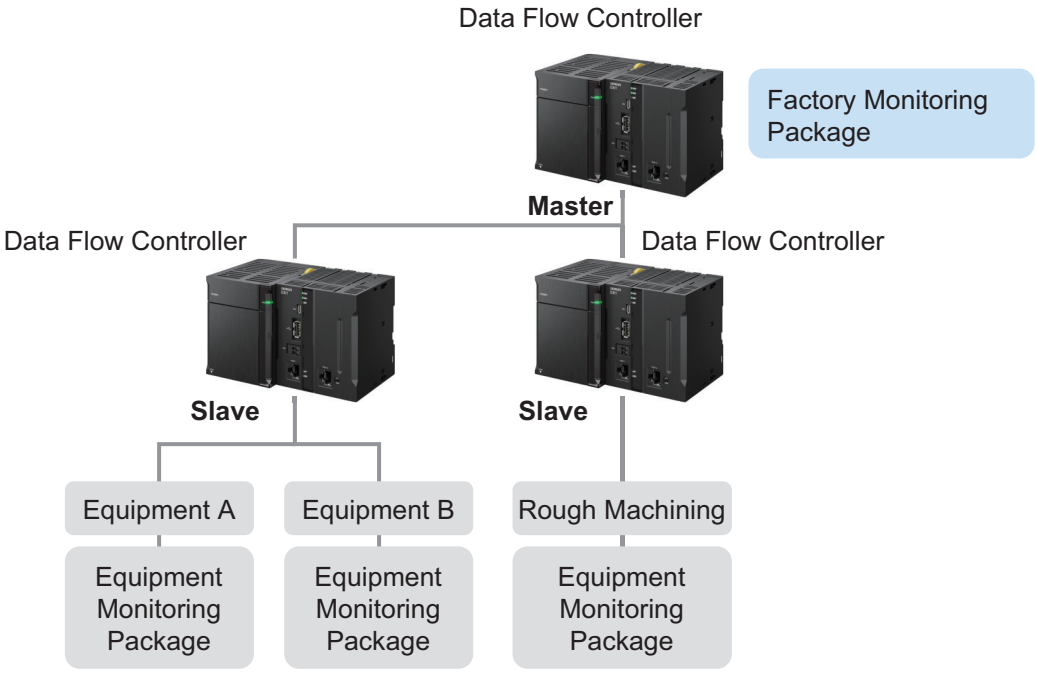


1-2 Example System Configurations

Two examples of system configurations are shown:

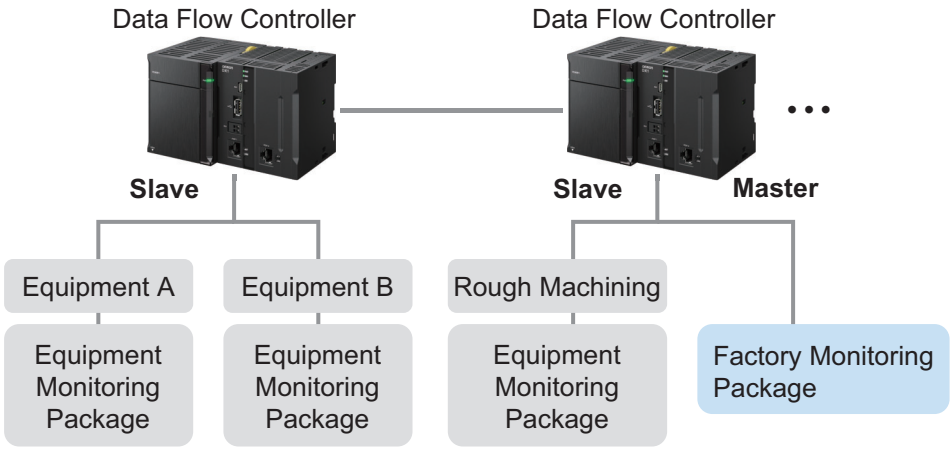
Example System Configurations (1)

- **Configuration using a standalone Data Flow Controller as the master**



Example System Configurations (2)

- **Configuration using a Data Flow Controller registered with the equipment monitoring package as both slave and master**



2

Operating Procedure

This chapter explains the procedure for using the Factory Monitoring Package.

2-1 Overall Workflow

The following is the overall workflow for using the Factory Monitoring Package.
Refer to the manuals or instruction manuals of each device for wiring, installation, configuration, and software startup procedures.

Configure all devices on the same network

Wiring, installation, and configuration of measurement devices	Refer to the manuals or instruction manuals for the measurement devices in use.
Wiring, installation, and configuration of the Data Flow Controller	Refer to *3 Installation, Wiring, and Turning ON/OFF the Power Supply* in the *DX-series Data Flow Controller User's Manual*.

Launch the Dashboard Generator

Start the following web applications: • Dashboard Generator • SpeeDBee Synapse • Grafana	Refer to *4-1 Operating Procedure from the First Login to User Registration* in the *DX-series Data Flow Controller User's Manual*. Refer to *4-3 Procedure for Collecting and Visualizing Data Using Dashboard Packages* in the *DX-series Data Flow Controller User's Manual*.
Perform initial setup of the Dashboard Generator	Refer to *2-2 Basic Operations of the Dashboard Generator* in the *DX-series Dashboard Generator User's Manual*.

Configure the Factory Monitoring Package (SpeeDBee Synapse, Grafana)

Start the Factory Monitoring Package	Refer to *2-2 Starting the Factory Monitoring Package* on page 2-3.

Start Monitoring (Operation)

2-2 Starting the Factory Monitoring Package

For procedures from logging into the Dashboard Generator to applying settings to SpeeDBee Synapse and Grafana, refer to *Section 2-2 Using the Dashboard Generator* in the *DX Series Dashboard Generator User's Manual*.
This chapter assumes that the Equipment Monitoring Package, which serves as the slave side of the Factory Monitoring Package shown in *Section 1-2 Example System Configurations*, is operating correctly.
For instructions on using the Equipment Monitoring Package, refer to the *DX Series Equipment Monitoring Package Manual*.

2-2-1 Configuration Procedure

Follow the steps below.
This procedure assumes that the Dashboard Generator, Synapse, and Grafana are already integrated.

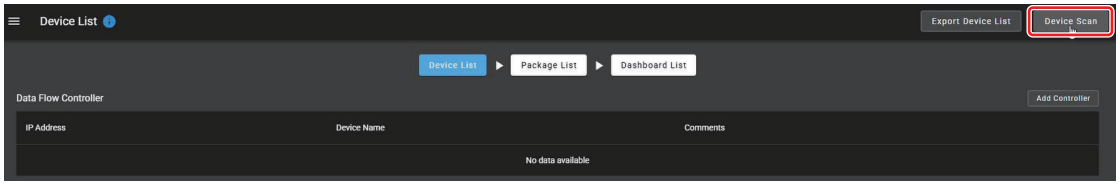
Configuration Steps	Details
Device List Screen Configuration	Perform a device scan to retrieve information about devices connected via the Factory Monitoring Package.
↓	
Package List Screen Configuration	Select the Factory Monitoring Package and specify the equipment identification information and the device to be used for dashboard registration. Register the dashboard based on the specified settings.
↓	
Preliminary Steps for Security Configuration	Create master.csv Create slave_list.csv *1 Generate a CA certificate (for encrypted communication via HTTPS)
↓	
Dashboard List Screen Configuration (Synapse / Grafana)	Launch Synapse and start the Error Manager. Configure security settings. Launch the Grafana dashboard (graph view).

*1 The configuration procedures for *Example System Configurations (1)* and *Example System Configurations (2)* differ in the creation of the **slave_list.csv** file.

Device List Screen - Device Scan

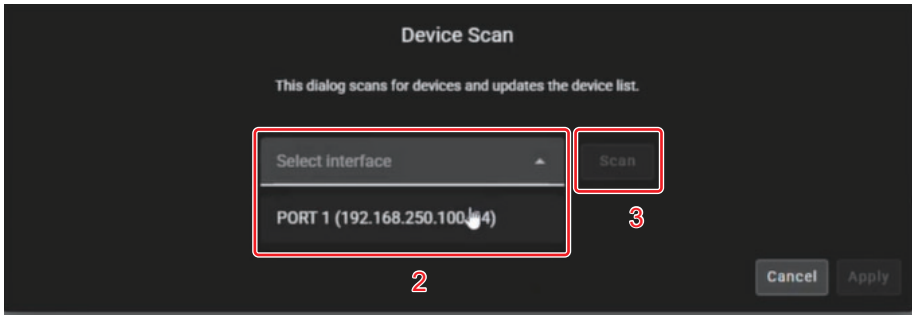
1 Click the **Device Scan** Button at the top right of the Device List Screen.

The *Device Scan Screen* will appear.

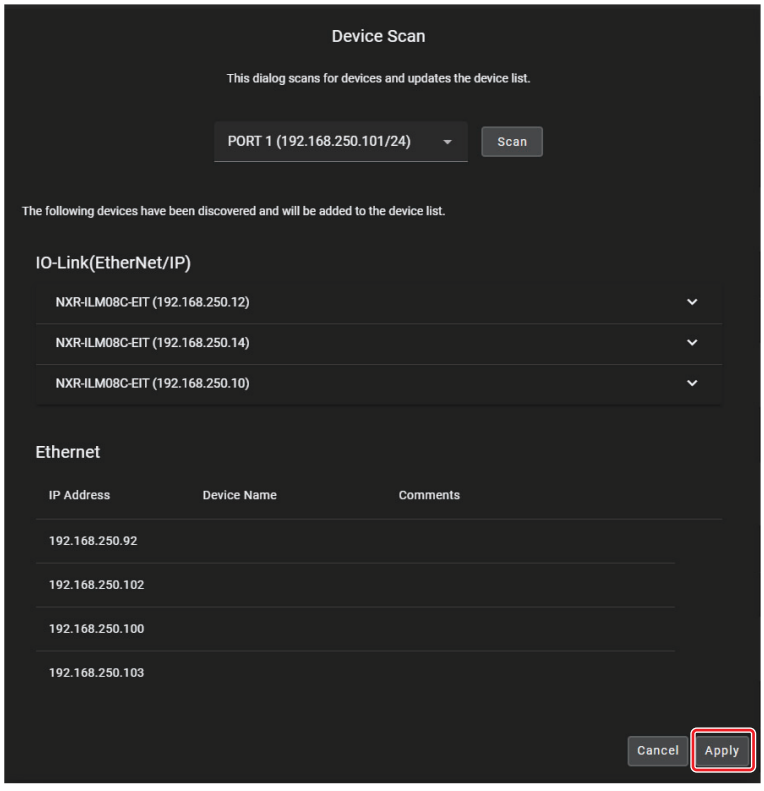


2 Select the interface from the dropdown menu.

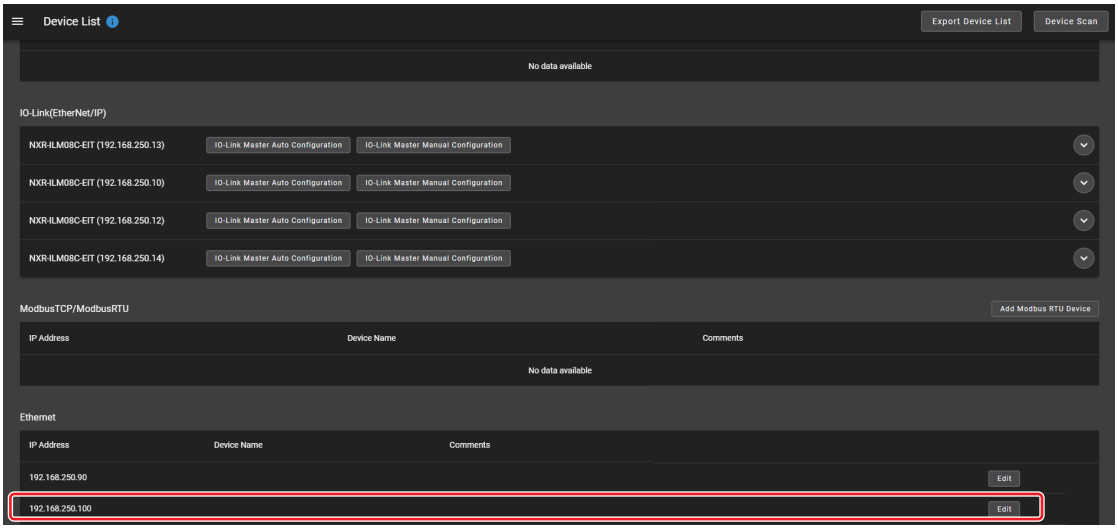
3 When the **Scan** Button becomes active, click it.



4 The scanned devices will be displayed. Click the **Apply** Button.



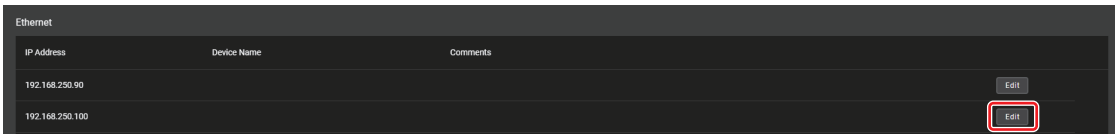
You will return to the *Device List Screen*. Confirm that the devices have been updated.
The IP address of the slave-side Data Flow Controller will be shown at the bottom under the Ethernet section.
Example: 192.168.250.100



Note: 192.168.250.215 is the IP address of the operating PC.
Note: 192.168.250.239 is the IP address of the PoE switching hub.

5 Click the **Edit** Button.

The *Edit Device Screen* will appear.



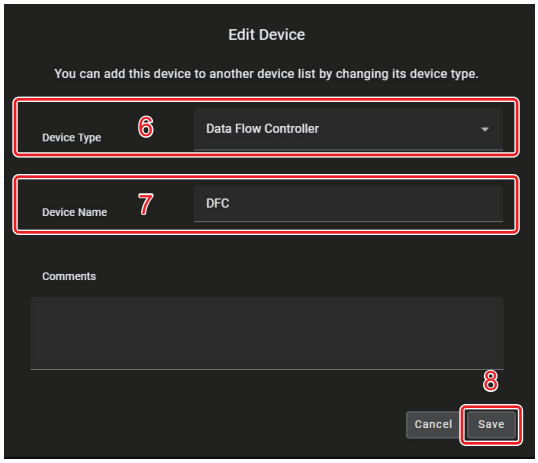
6 From the **Device Type** dropdown menu, select **Data Flow Controller**.

7 Enter a desired name in the **Device Name** field.

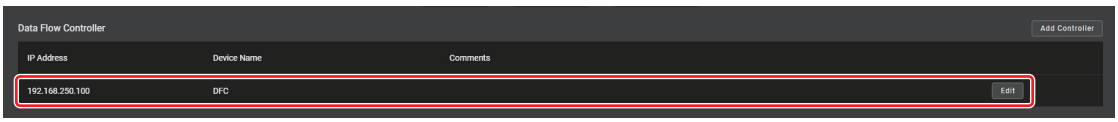
Example: DFC

8 Click the **Save** Button.

You will return to the *Device List Screen*.



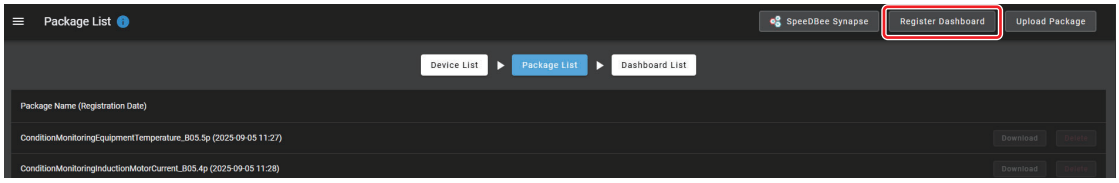
Confirm that the IP address and DFC are now displayed in the **Data Flow Controller** field.



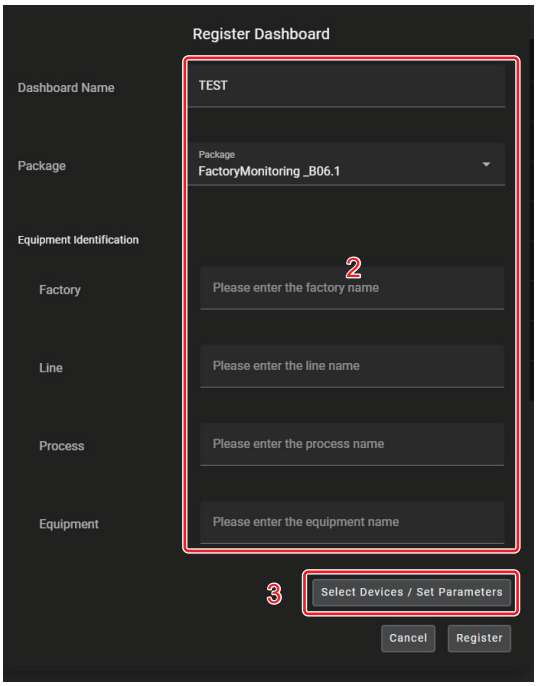
Package List Screen - Dashboard Registration

1 Click the **Register Dashboard** Button at the top right of the *Package List Screen*.

The *Register Dashboard Screen* will appear.



2 Configure the information on the *Register Dashboard Screen*.



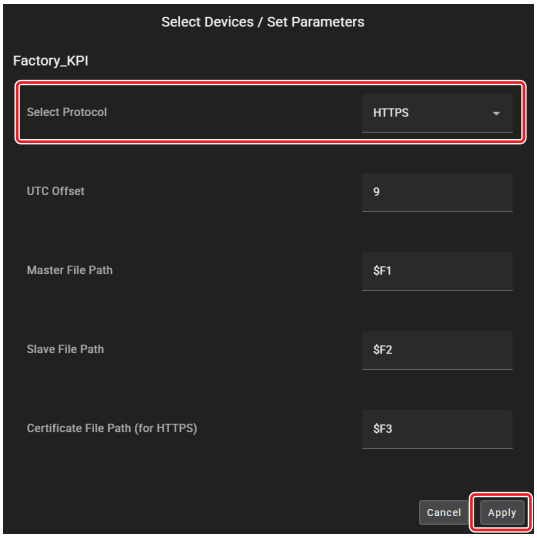
Setting Item	Description
Dashboard Name	Enter a desired name. It will be displayed in Synapse and Grafana. Example: Factory Monitoring Package
Package	Select Factory Monitoring Package.
Equipment Identification	Optional input fields. Includes factory name, line name, process name, and equipment name.

3 When the **Select Devices / Set Parameters** Button becomes active, click it.

The *Select Devices / Set Parameters Screen* will appear.

4 Enter the KPI configuration.

This includes security-related settings.



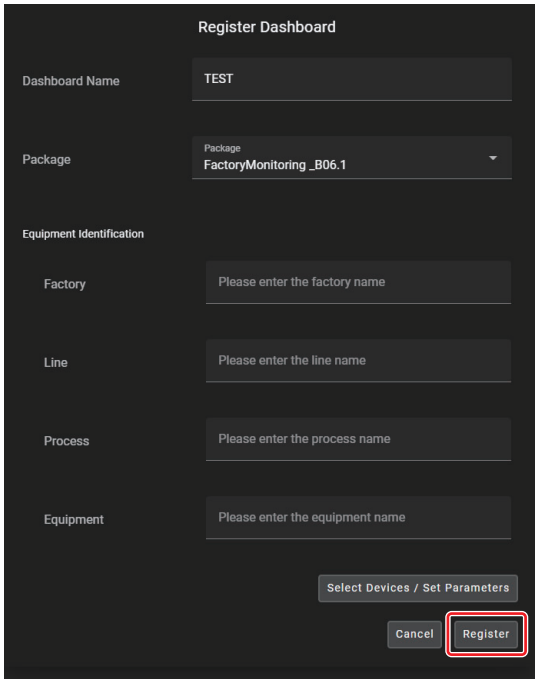
KPI	Setting Item and Description
Factory_ KPI	*Select Protocol*: Select HTTPS.
	UTC Offset: Enter the time difference from UTC.
	Master File Path: Configured in Step 8 on page P. 2-11.
	Slave File Path: Configured in Step 8 on page P. 2-11.
	Certificate File Path (for HTTPS): Configured in Step 8 on page P. 2-11.

5 Click the **Apply** Button.

You will return to the *Register Dashboard Screen*.

6 Click the **Register** Button.

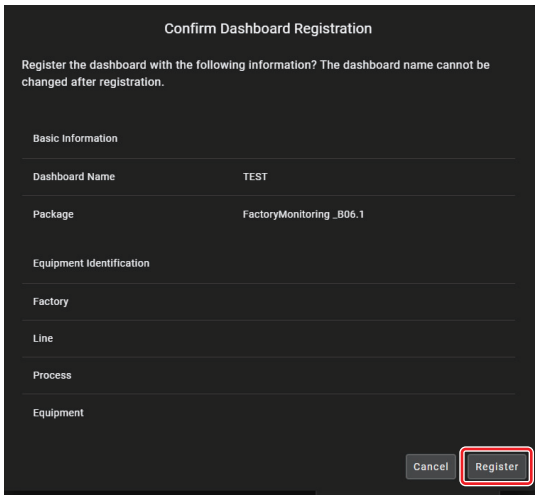
The Confirm *Dashboard Registration Screen* will appear.



7 Click the **Register** Button.

Dashboard registration takes approximately 30 seconds.

Once registration is complete, the system will transition to the *Dashboard List Screen*.



Preliminary Steps for Security Configuration

To establish secure data communication between factories, the following configurations are required.
Create the following files in advance and upload them during the setup process.
This section explains how to create each required file.

- master.csv
- slave_list.csv
- CA certificate (required only when using encrypted communication via HTTPS)

● Creating master.csv

user_id	password
Administrator ID for the Synapse corresponding to the master	Administrator password for the Synapse corresponding to the master

Use Windows Notepad to enter the following text.
After entering the text, change the file extension to **.csv** and save the file.

Example

```
user_id,password
admin,admin
```

● Creating slave_list.csv

Include the data flow controller that serves as both master and slave, as shown in *Example System Configurations (2)* in *Section 1-2 Example System Configurations*, in this **slave_list.csv** file.

slave_no	ip	user_id	password
1	IP address of the slave	Administrator ID for the Synapse corresponding to the slave	Administrator password for the Synapse corresponding to the slave
2	:	:	:
:	:	:	:
N	:	:	:

Use Windows Notepad to enter the following text.
After entering the text, change the file extension to **.csv** and save the file.

Example

```
slave_no,ip,user_id,password
1,192.168.250.100,admin,admin
2,192.168.250.101,admin,admin
```

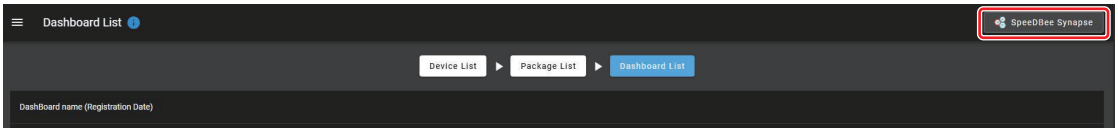
● Creating a CA Certificate

Required only when using encrypted communication via HTTPS.
For detailed instructions, refer to *Appendix A-1 CA Certificate Registration Procedure (When Using the Factory Monitoring Package)* on page A-2.

Dashboard List Screen - Launching Synapse

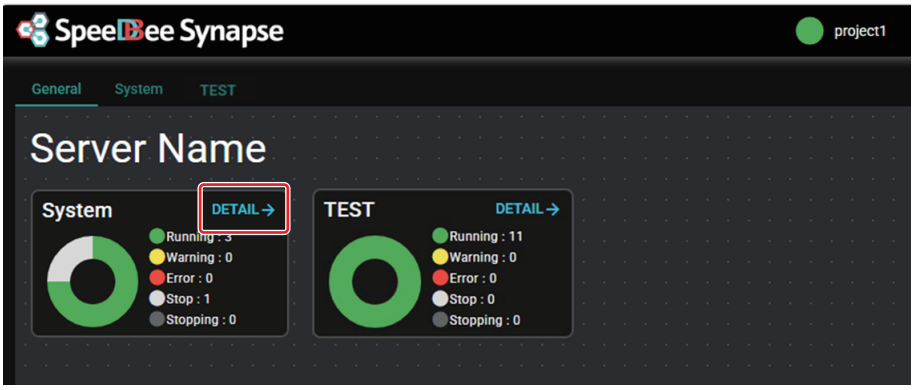
1 Click the **SpeeDBee Synapse** Button at the top right of the *Dashboard List Screen*.

The *SpeeDBee Synapse Screen* will appear.



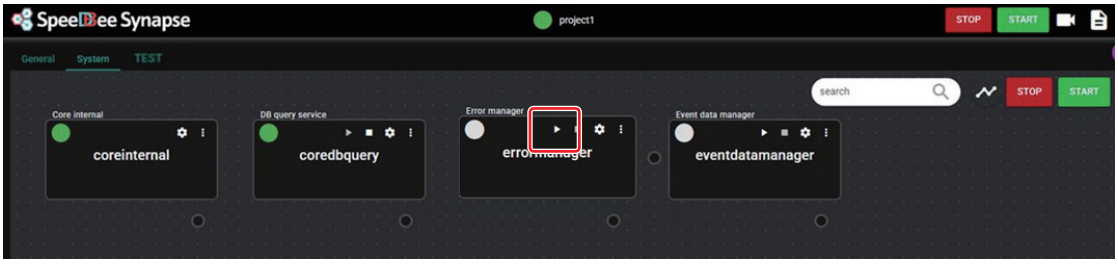
2 On the *System Panel*, click **DETAIL** Button (for Error Manager configuration).

The screen will transition to the *Synapse Connection Screen*.

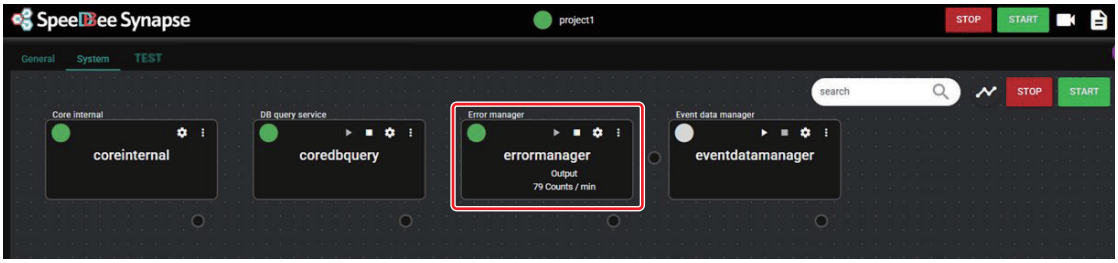


Note: A panel with the specified dashboard name will be added on the right side.
Example: Factory Monitoring Package

3 Click the ▶ (**Launch**) Button on the *Error Manager Component*.

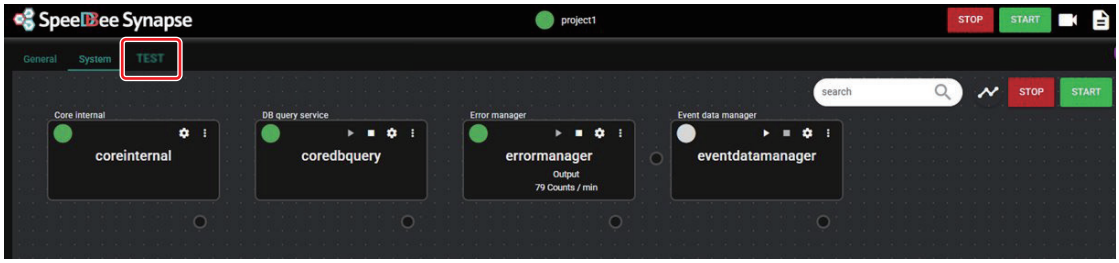


The Error Manager will start.



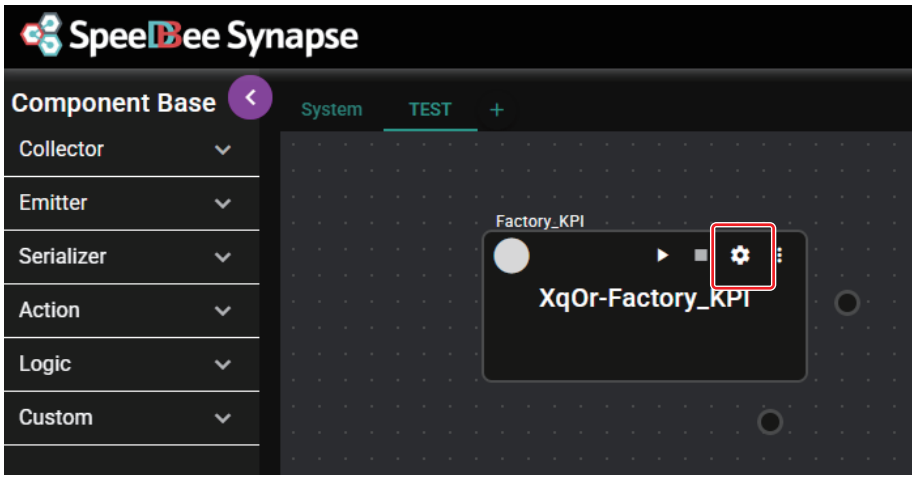
Note: Error Manager is required for Grafana to retrieve data from Synapse.

4 Click the tab labeled with the desired dashboard name at the top left.
Example: Factory Monitoring Package

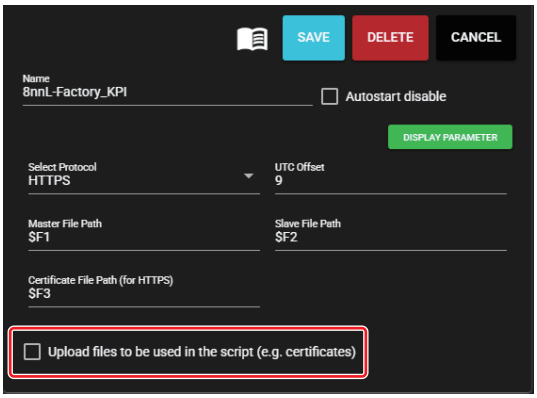


5 Change **Run** to **Edit** at the top right of the *SpeeDBee Synapse Screen*.

6 Click the ⚙ on the *Factory_KPI Component.*



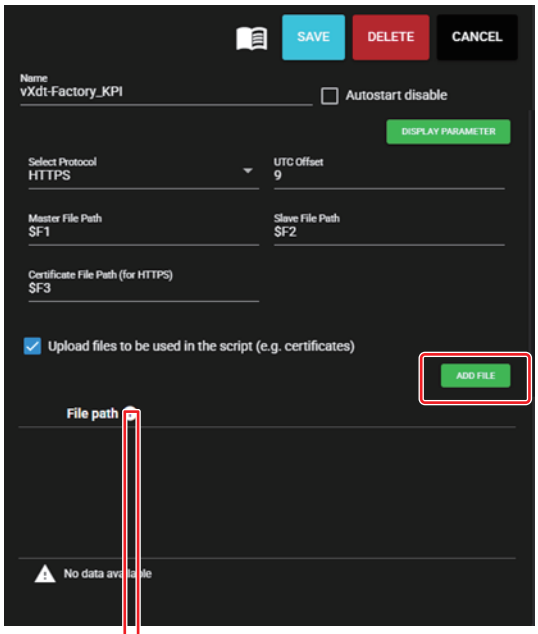
7 Click the **Upload files to be used in the script (e.g. certificates)** checkbox.



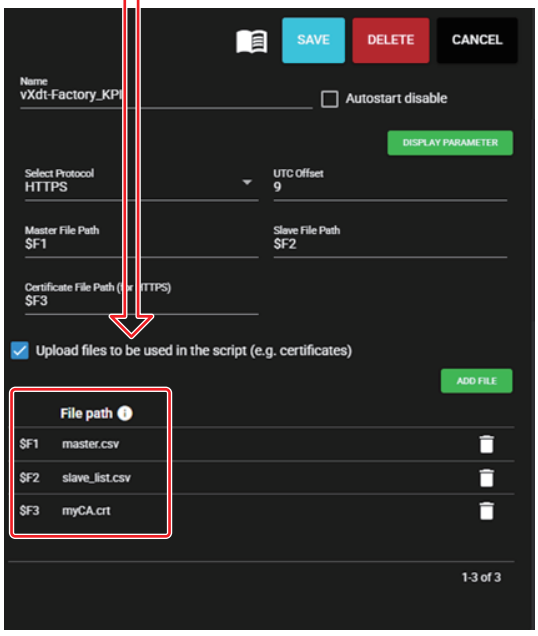
8 Click the **ADD FILE** Button.

The file selection screen will appear.
Upload the files created during the security configuration preparation in the following order:

- master.csv
  ↓
- slave_list.csv
  ↓
- CA certificate (required for encrypted communication via HTTPS)
  myCA.crt



Select the files in the specified order.
If you upload a file incorrectly:
Delete the incorrect file entry.
Upload the file again.
The new file path will be assigned as "$F4".
Update all file paths in the script to match the new locations:

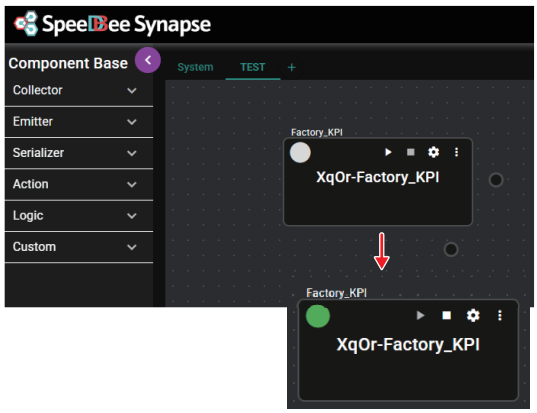


9 Click the **Save** Button.

You will return to the Panel Screen.

10 Click the ▶ Button on the *Factory_KPI Component*.

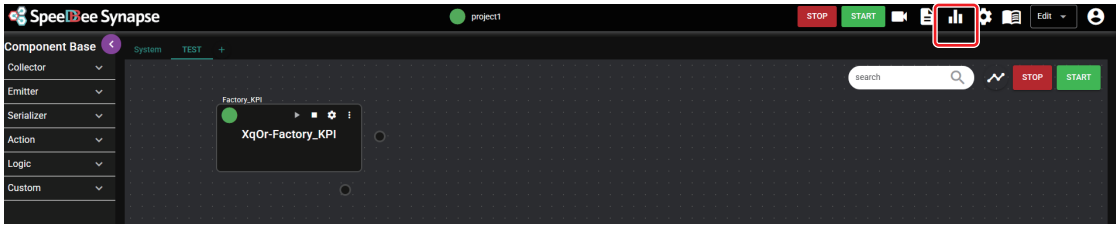
Synapse will start.



Dashboard List Screen - Launching Grafana

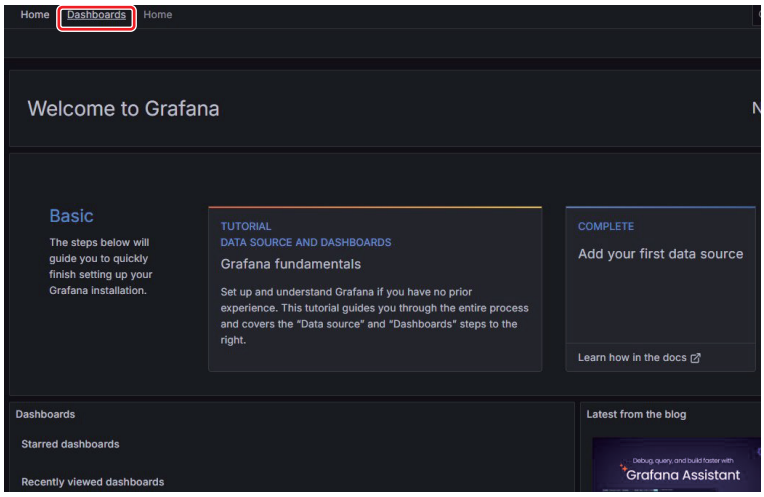
1 Click the graph icon in the upper-right corner of the *Synapse Screen*.

The *Grafana Screen* will appear.



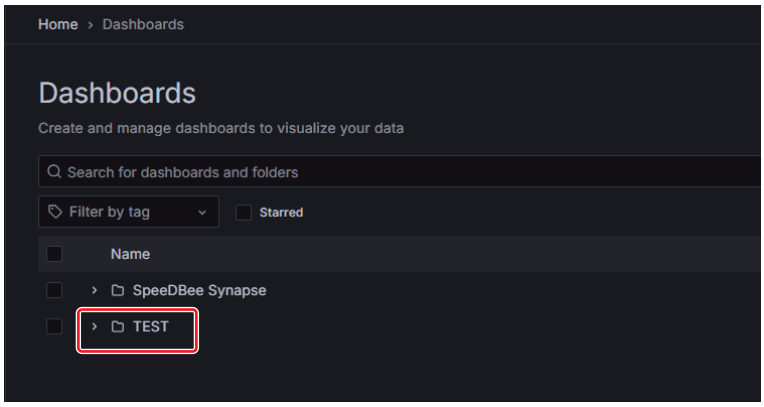
2 Click **Dashboards**.

The screen switches.



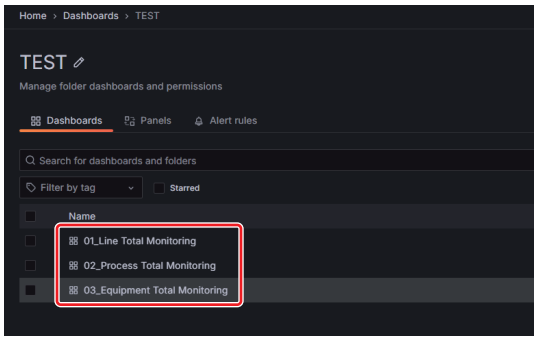
3 Click any dashboard name that has been added.

Example: Factory Monitoring Package

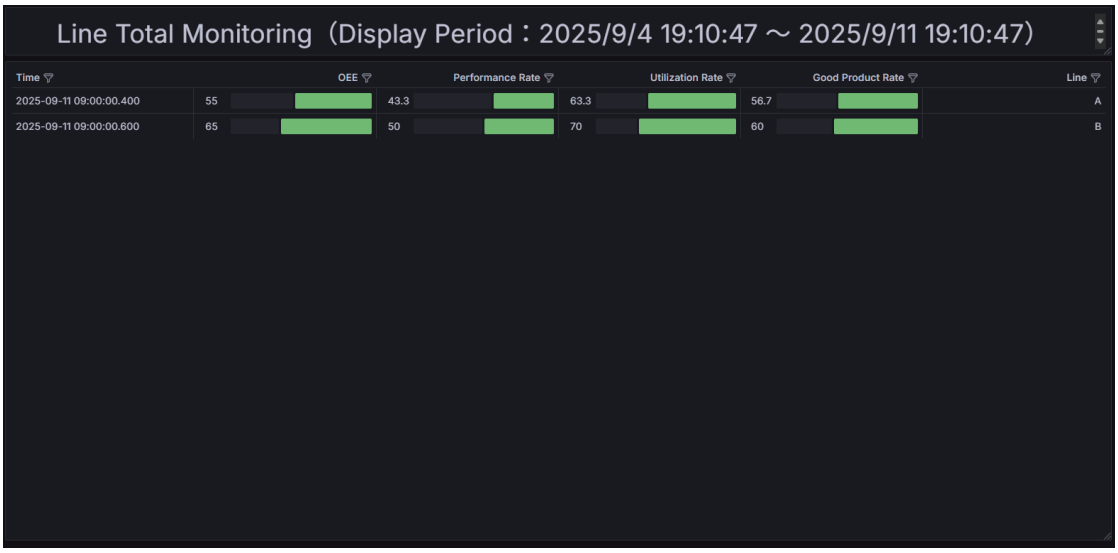


4 Click **Line Total Monitoring**.

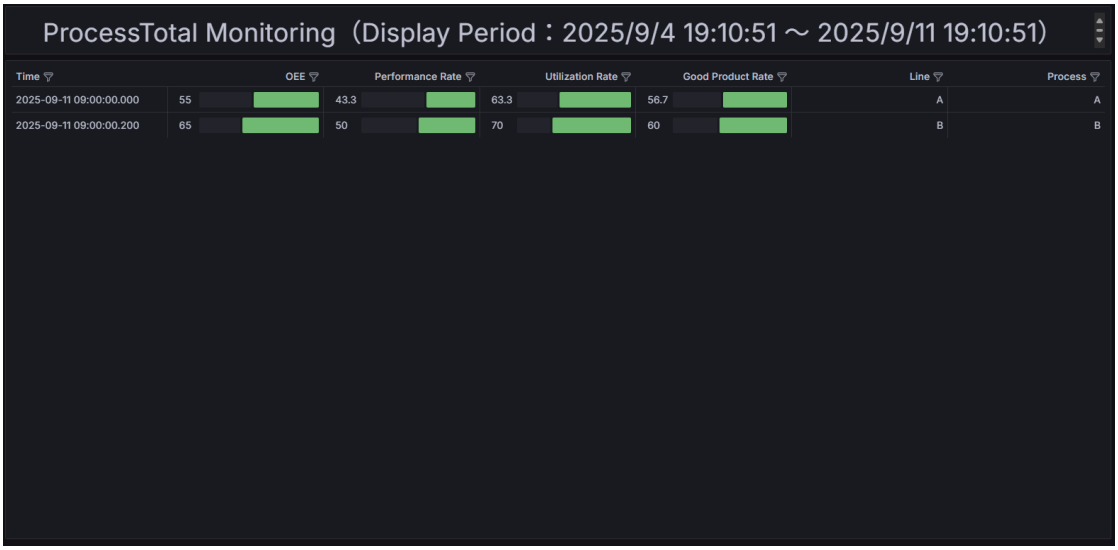
The screen switches.



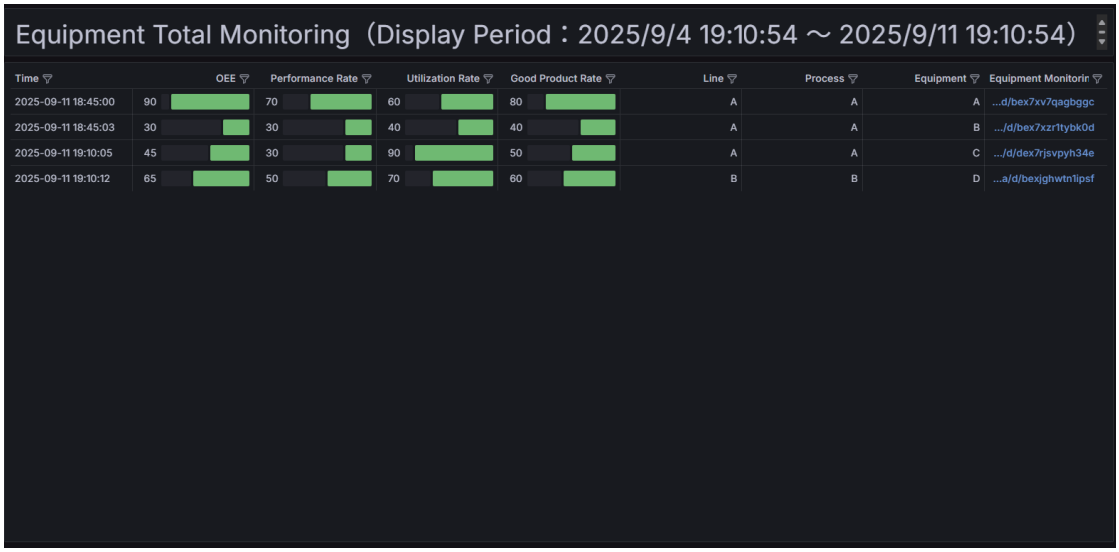
●Example of *Line Total Monitoring Screen*



●Example of *Process Total Monitoring Screen*



●Example of *Equipment Total Monitoring Screen*



Note: Line names, process names, and equipment names reflect the equipment identifiers specified in the dashboard registration settings.

2-3 Method for Outputting KPIs of the Factory Monitoring Package

This section describes how to output KPI data (Overall Equipment Effectiveness (OEE), performance availability, time availability, and yield rate) to a file.

1 Configuration of KPI Calculation Component

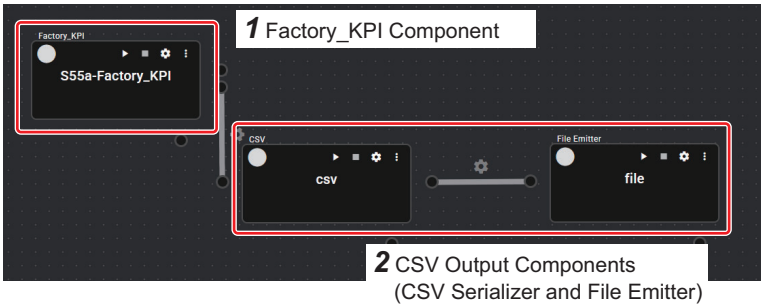
The Factory_KPI component aggregates KPIs on a daily basis.
These KPIs are calculated by the Equipment Monitoring Package running on the slave DX1.
The KPIs are as follows: Overall Equipment Effectiveness (OEE), performance availability, time availability, and yield rate. The Factory_KPI component has two output ports. The upper output port is used for Grafana display. The lower output port is used to output data to subsequent components.

2 File Output Method

Connect a CSV Serializer and a File Emitter to the lower output port of the Factory_KPI component.

3 CSV Serializer Settings

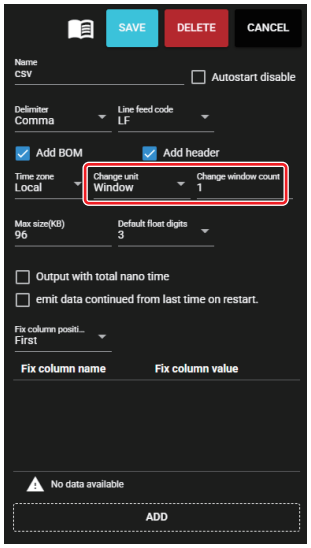
Set Switching criterion to [Window]. Set Number of switching windows to [1].



1 Factory_KPI Component

2 CSV Output Components
(CSV Serializer and File Emitter)

3 CSV Serializer Settings Screen



4 Output Data Specifications

The output data specifications are as follows.
The KPI data corresponds to aggregation_date. The timestamp (data output time) does not correspond to the KPI data.

timestamp	Data output time
aggregation_date	KPI calculation time
oee	Overall equipment effectiveness [%]
performance_rate	Performance availability [%]
utilization_rate	Time availability [%]
good_product_rate	Yield rate [%]
factory	Factory name
line	Line name
process	Process name
equipment	Equipment name
dashboard_link	Grafana dashboard link

A

Appendices

A-1 CA Certificate Registration Procedure (When Using the Factory Monitoring Package)

Steps on the Client PC

1 Install OpenSSL

- Download and install OpenSSL version 1.1.1 or later from Shining Light Productions.

2 Launch the OpenSSL Command Prompt

3 Navigate to the folder for certificate creation

```
cd "absolute path to the certificate creation folder"
```

4 Create a private CA (only once)

- Run the following command to generate the CA private key.

```
openssl genrsa -out myCA.key 4096
```

5 Generate a self-signed CA certificate

- Run the following command to create the self-signed CA certificate.

```
openssl req -x509 -new -nodes -key myCA.key -sha256 -days 3650 -out myCA.crt -subj
"/C=JP/ST=Tokyo/O=MyCompany/OU=IT/CN=MyPrivateCA"
```

- myCA.key: CA private key (must not be shared externally)
- myCA.crt: CA certificate (to be distributed to clients)
- Validity period is set with -days 3650.

6 Generate server certificates (repeat for each server)

(1) Create san.conf

Contents of san.conf

```
[ req ]
default_bits       = 2048
distinguished_name = req_distinguished_name
req_extensions     = v3_req
prompt             = no

[ req_distinguished_name ]
C  = JP
ST = Tokyo
L  = Tokyo
O  = MyCompany
OU = Server
CN = 192.168.250.100  # change IP address for each slave

[ v3_req ]
subjectAltName = @alt_names

[ alt_names ]
IP.1 = 192.168.250.100  # change IP address for each slave
```

(2) Generate the server's private key
Change the name of *server100* for each slave.

```
openssl genrsa -out server100.key 2048
```

(3) Create the server's CSR (Certificate Signing Request)
Change the name of *server100* for each slave.

```
openssl req -new -key server100.key -out server100.csr -config san.conf
```

(4) Sign the CSR with the CA to issue the server certificate
Change the name of *server100* for each slave.

```
openssl x509 -req -in server100.csr -CA myCA.crt -CAkey myCA.key -CAcreateserial -out
server100.crt -days 3600 -sha256 -extfile san.conf -extensions v3_req
```

Server Certificate Registration to Slave

- Refer to the *DataFlowController Web UI Instruction Manual* and register the server certificate *server 100.crt* and the private key *server100.key*.

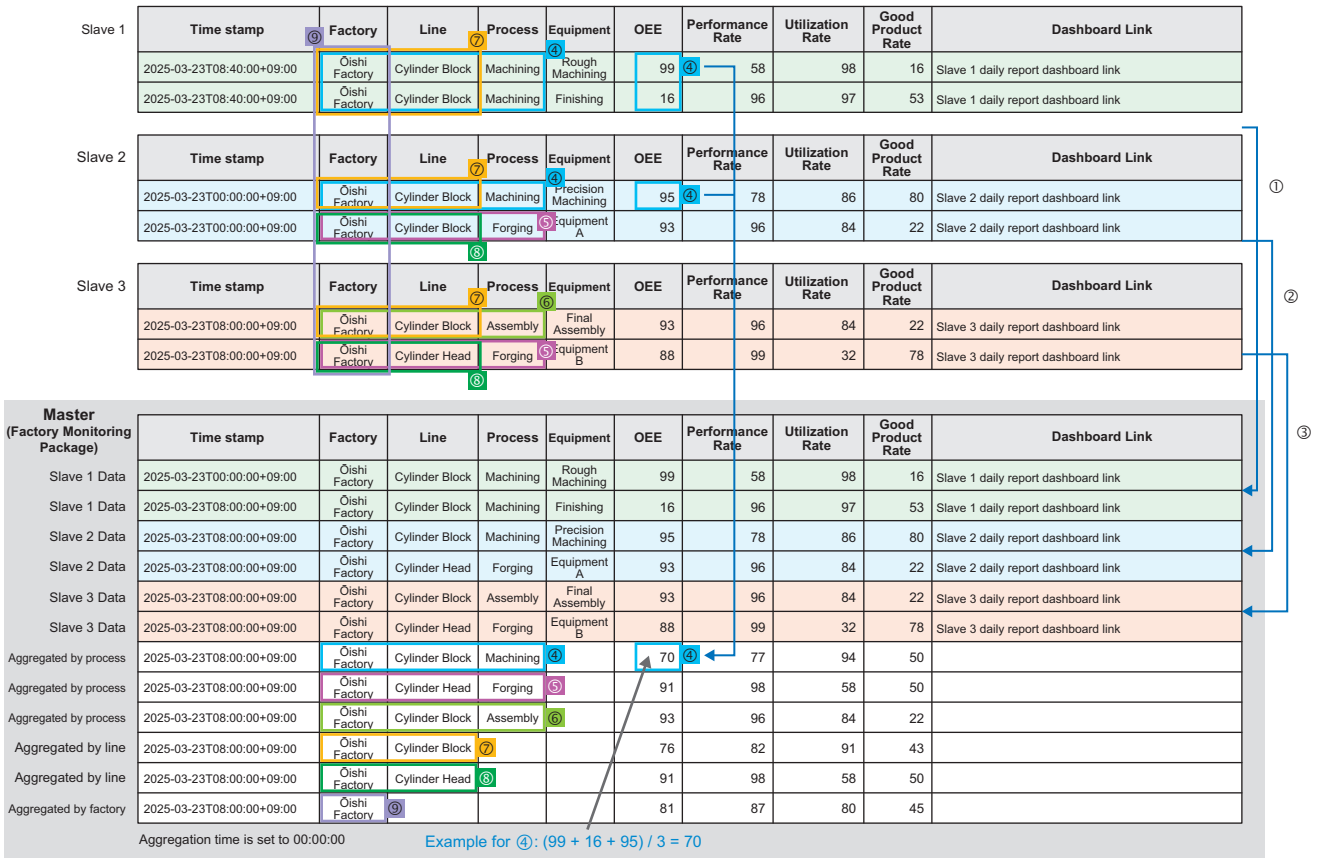
myCA Registration in Factory Monitoring Package

- After registering the Dashboard Generator to the dashboard, navigate to the Synapse screen, open the configuration screen for the KPI_factory component, and upload myCA.crt.

A-2 Slave Data Aggregation Method

The Factory Monitoring Package collects the following data:
The factory monitoring package collects data from the slave equipment monitoring package once a day at 01:00 AM.

- From each slave's Equipment Monitoring Package, it collects equipment identification information, OEE, performance rate, utilization rate, good product rate, and daily report dashboard link (see examples ①②③).
- Each KPI is calculated as a simple average for each hierarchical level of equipment identification (factory, line, process) (see examples ④⑤⑥⑦⑧⑨).



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Tutorial Video

https://www.fa.omron.co.jp/dx1/video-manual/en/

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