Integrated Plant Information Management System
ePREXION

Overview

ePREXION automatically collects, calculates, and stores process data and manufacturing data from monitoring and control systems (DCS, PLC, etc.) in plants and factories in a variety of industries, and ensures long-term storage of the collected history data. Data collected and stored by ePREXION can be easily used on networked PCs in various departments. Moreover, ePREXION can be used as an application platform for managing information on operations, energy, etc.

The main three components of ePREXION are as follows (the functional configuration is shown in figure 2).

- Device IO service (data collection function)
- Real-time history server (data storage/management function)
- ePREXION client (data use function)

The device IO service functions as an interface with various monitoring and control systems, and collects process data from them. Data writing to devices is also possible.

The real-time history server adds a time stamp to the process data collected by the device I/O service and stores it as history data. The server also returns data to clients when requested.

The ePREXION client provides middleware for accessing data stored in the real-time history server and application software for using ePREXION's data. History Trend Chart, History Manager, and History Data Client are provided as standard application software for using data.

Overview of Functions

■ Device IO Service

The device IO service collects process and manufacturing data from control systems on a regular cycle for Continuous History.

ePREXION collects data via an OPC interface (the industry standard), MELSEC Ethernet units (using Ethernet communication), or MELSEC high-speed logger units (using text files).

● Route redundancy for device IO services

When a monitoring and control system has multiple OPC servers, multiple data collection paths can be created so that collection continues even if one of the OPC servers stops operating. Idle redundancy and dual redundancy are available as redundancy methods.

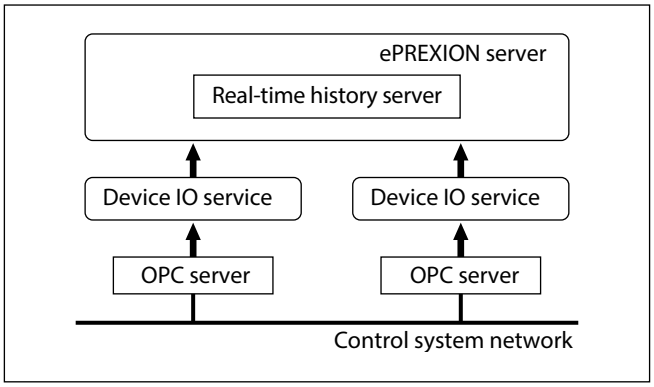

Figure 1. Route redundancy for device IO services

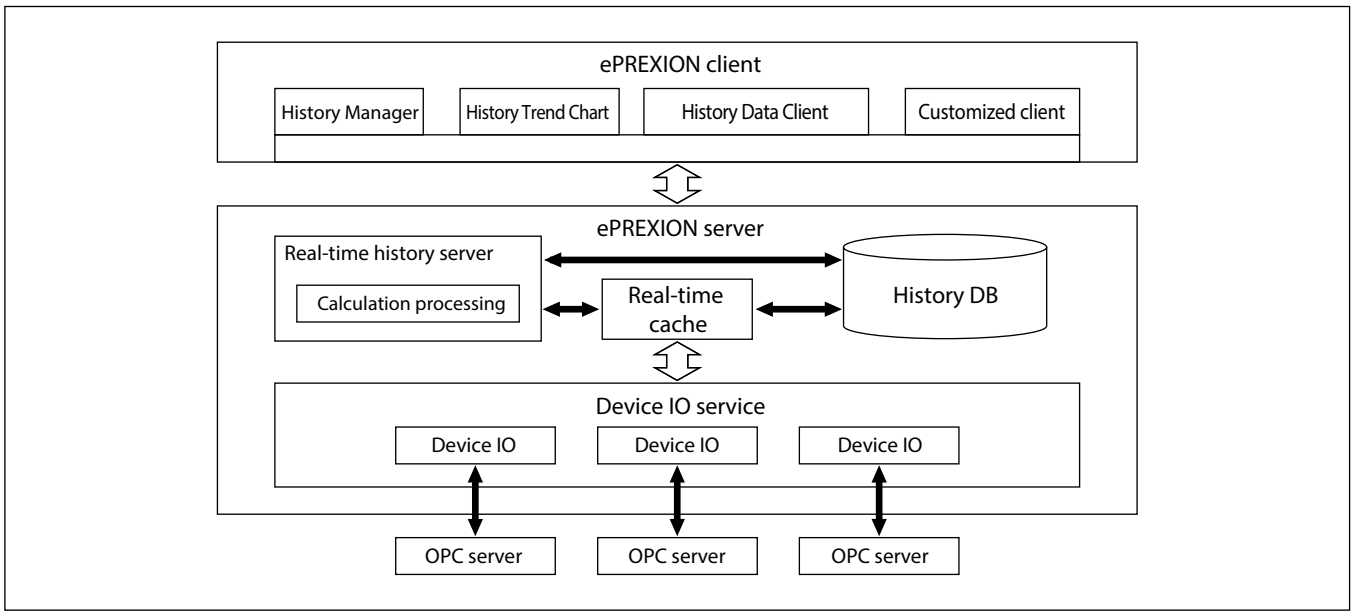

Figure 2. Functional configuration

● Recovery function

By assigning the real-time history server and the server on which device IO services run to different PCs, even if the real-time history server stops operating, data collected by the device IO service can be retained in the form of recovery files on its server. When the real-time history server is restored, the data at the time when the server stopped operating can be retrieved from the recovery files.

■ Real-time History Server

● Continuous History

The real-time history server adds a time stamp to the data collected by the device I/O service and stores it as history data. Data that is not in the control systems, such as calculated items and manual input items can be added to the real-time history. The server can also return raw values or the processed values shown below that fall within a user-specified interval, so that the user can obtain necessary data outside of the fixed collection cycle.

- Stored value (raw value) / interpolated value
- The snapshot or average of the values within a user-specified interval
- The maximum or minimum value of the values within a user-specified interval
- The total of the values within a user-specified interval
- The delta (amount of change) or delta with rollover correction of the value within a user-specified interval

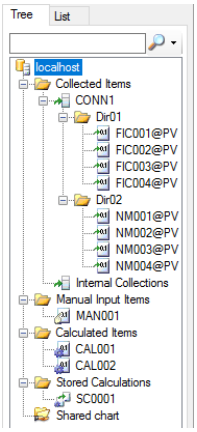

Figure 3. Managing items in a tree format

Also, when a host application needs real-time data, the latest collected data is returned as real-time data. In the real-time history server, process data can be sorted into directories or subdirectories in units of the plant/area/equipment unit, or line/process/equipment, etc., in a hierarchy matching the actual equipment configuration, for easy management. This enables users to quickly access the target data, as if they were using Windows Explorer. Users can also search for data by entering the name (descriptor) as a keyword. It is also possible to insert data into the history data managed by the real-time history server, or modify the stored data.

History data can be archived to external media devices manually or automatically. The data collection period specified for a history data file can be checked in the archive setting window, so the user can quickly search an external media device for a desired data file.
When transferring data from an existing control system to ePREXION, tags for the collected and stored data can be specified at once using the text file exported from the tag database of the control system.

- Export of history data and item information files

History data and item information managed by ePREXION can be output by the ePREXION server as text files.
The files can be output directly from the ePREXION server or from a networked machine. Therefore, when the manufacturing management system needs process data, the user can easily upload operation information using this file output function.

● Calculation processing function

ePREXION's calculation functions are as follows:

- Calculated item

Calculated items can be used in the same way as normal collected items, and users can define calculations that use the values of multiple items.

- Trigger

Triggers execute some process when the value of a monitored item changes.

- Numerical function

Numerical functions can be used in calculated items or triggers.

- Creating internal collection and stored calculation items

These items are used to store the value of calculated items on a specified cycle. Calculated items, triggers, and numerical functions are used in these items.

- Collection filter

Data collected by device IO services can be processed before being stored.

■ Event History Server Function (Optional)

● Standard events

Standard events such as process alarms, operator actions, and messages that are issued by Advanced-PS or Harmonas-DEO can be collected automatically.

● User-defined events

The user can specify a control system flag as an event trigger and select items (tags) to be collected. The items' data is collected only when the specified event trigger flag turns on. Either one-shot collection, which is executed as soon as the trigger flag turns on, or cyclic collection, which works while the trigger flag is on, can be selected.

● Lot history management function

The lot history management function is used to combine manufacturing data that was collected upon the occurrence of user-defined events (usually, an event is defined for one manufacturing process), using the lot ID and batch number of the collected data as keys.
Only user-defined events with the one-shot collection setting can be specified for this function.

■ ePREXION Client

The ePREXION client provides an environment for using data managed by ePREXION.

● History Manager

With ePREXION History Manager, the user can create ePREXION items, enter expressions (mathematical formulas), etc.
An expression can refer to other expressions. Expressions are displayed in a tree format so that the user can easily identify an expression that is located deep in a hierarchy.

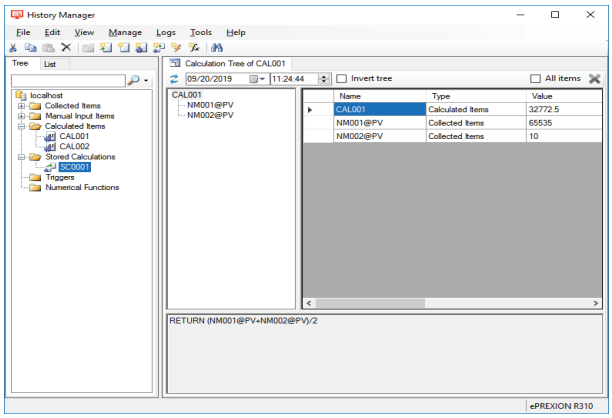

Figure 4. History Manager (calculation tree)

● History Data Client

With ePREXION History Data Client, the user can display the data that was read from the real-time history server and edit the values.

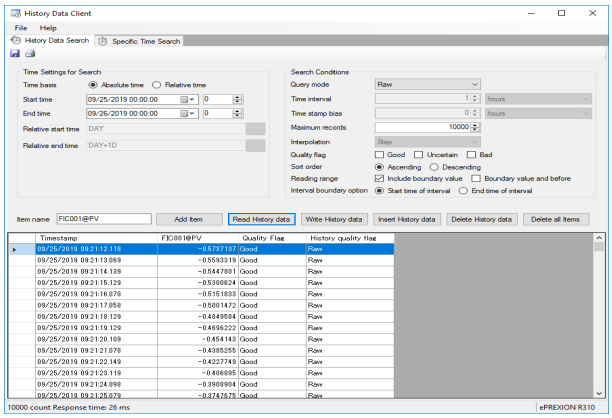

Figure 5. History Data Client

● History Trend Chart

History Trend Chart is an application that displays ePREXION history data in a trend chart. Most of its many functions, such as timeline scrolling and zooming, can be executed using a mouse. In addition, when multiple trend charts are displayed, the user can move an item from one chart to another intuitively by drag and drop.

In a displayed graph, the timeline can be scrolled for each item, making it easy to compare data at different times. If the trend data display period includes the present time, data is automatically updated with the latest collected data. The main features of the application include scrolling, hairline cursor, and zooming.

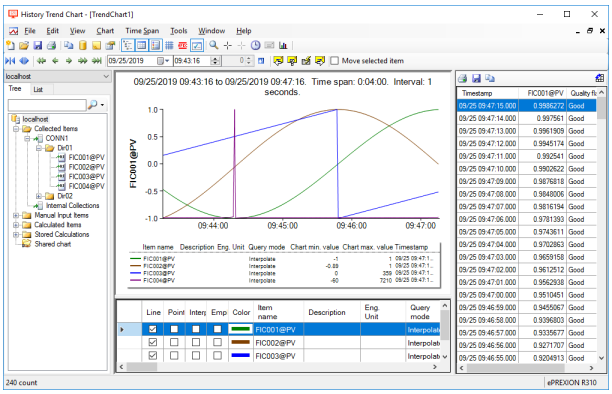

Figure 6. History Trend Chart

● API (Application Program Interface)

ePREXION provides many APIs that can be used from a user-customized program or from a variety of products made by third-party vendors. These APIs can be used from Excel, Access VBA, and/or VisualStudio.NET.

OPC DA server
OLE
.NET API

● History Link (Microsoft Excel interface)

History Link provides an environment for accessing ePREXION history data from Microsoft Excel.
To import ePREXION history data into Excel, call up Query Builder from the menu. It is also possible to process the history data that falls within a specific period and display the values (maximum, minimum, etc.) in Excel.

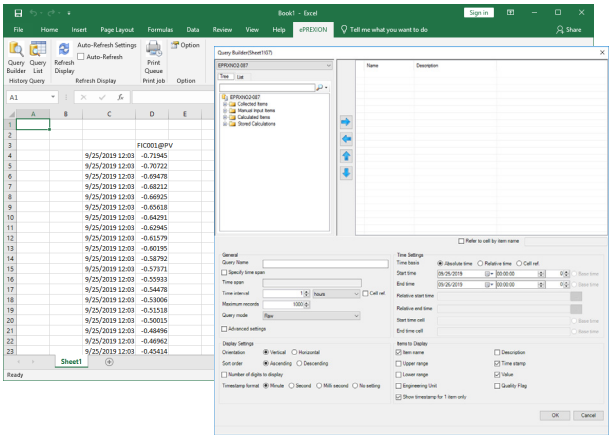

Figure 7. Importing data to Excel

● Print scheduling

This function is used to print or save created Excel files regularly.

● Query Builder

The desired data can be obtained simply by specifying tags, time, etc., using Query Builder. This tool provides the various methods for processing collected data (query modes) shown below, enabling users to obtain the data (raw values, average values, etc.) that they need. Query Builder can be called up from a History Trend Chart or Excel.

- Raw (stored value)
- Total
- Time Average
- Minimum Actual Time
- Maximum Acutual Time
- Start
- End
- Accumulation
- Interpolate
- Average
- Count
- Minimum
- Maximum
- Start Actual Time
- End Actual Time

etc.

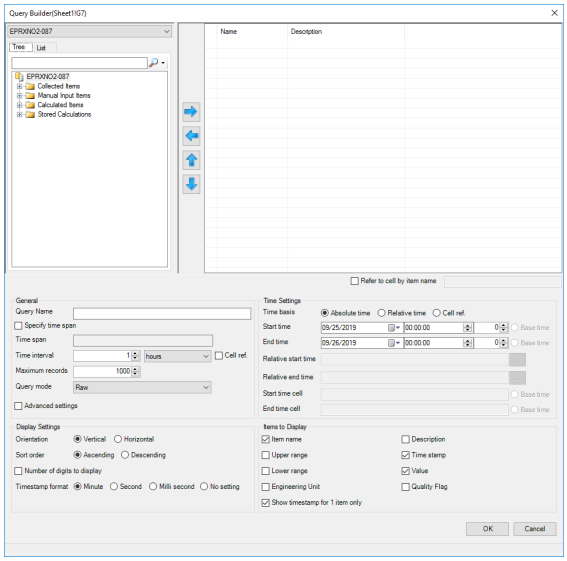

Figure 8. Query Builder

● Event History Viewer

This client tool is used to view standard events that were collected from the DCS and saved. Events are sorted by their type into tabs, so users can easily access the events they need to check. Searching, filtering, and displaying events of different types is also possible.

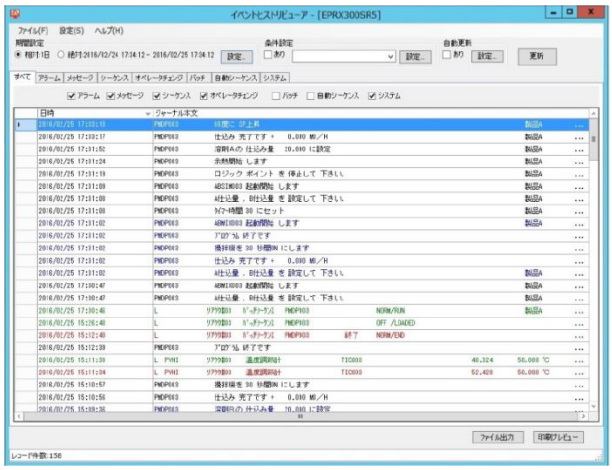

Figure 9. Event History Viewer

● Security

Each user ID that is logged in for client access can be assigned a "role" (with particular access rights). The following security settings can be configured for each role.

- Access level (system management, configuration, data access only, etc.)
- Permission to read history data from items in a specific directory only
- Permission to write history data to items in a specific directory only

The method of authenticating the user can be selected from two choices: "ePREXION" (ePREXION manages the password) and "Windows" (authentication of the Windows user that is logged in on the client).
User operations can be recorded in the audit log. The following information can be recorded:

- Unauthorized operation, such as entering an incorrect password
- Security definition change
- System definition change
- History data editing

System Configuration

If ePREXION is connected to control systems made by different vendors, it collects data from each system via OPC servers provided by the vendor or via a gateway or HMI (Human Interface) for the system.

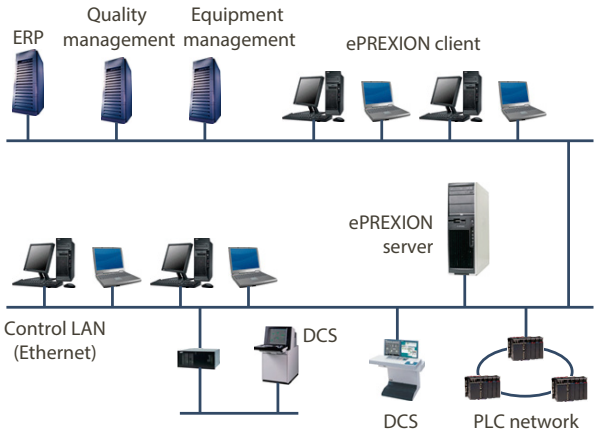

Figure 10. Example of system configuration

Operating Environment

Table 1. Operating environment of ePREXION server

Item	Specifications
CPU	Xeon 3.40 GHz 4 Core
RAM	8 GB (for 40,000 items) 16 GB (for 100,000 items)
HDD	Free space of 10 GB or more
OS	Windows Server 2019 (x64)
Software environment	SQL Server 2019 Express Edition .NET Framework 4.0, .NET Framework 4.5

Table 2. Operating environment of ePREXION client

Item	Specifications
OS	Windows 8.1 Update1 (32bit/64bit) Windows 10 Pro/Enterprise (32bit/64bit) Windows Server 2012 R2 Standard/Enterprise (64bit) Windows Server 2016 Standard (64bit) Windows Server 2019 Standard (64bit) Windows 11 Pro (64bit)
RAM	Recommended memory for OS
HDD	Free space of 1 GB or more
Software environment	Office 2016/Excel 2016 (32bit/64bit) Office 2019/Excel 2019 (32bit/64bit)

* Since Excel is continually updated, its operation in the future cannot be guaranteed.

ePREXION Server Specifications

Item	Specifications
Maximum number of items	100,000 Total number of collected items, manual input items, calculated items, stored calculations, numerical functions, and triggers
Number of collected items	100,000 max.
Number of manual input items	30,000 max.
Number of calculated items	30,000 max.
Number of stored calculations	10,000 max.
Number of numerical functions	3,000 max.
Number of triggers	1,000 max.
Data collection interface	OPC DA 2.05, OPC UA (Data Access, History Access), MELSEC TCP / IP, text files
Data writing interface	OPC DA 2.05, OPC UA (Data Access, History Access), text files
Number of data collection connections	30 max.
Collection cycle (OPC)	1 s to 10 days
Collection capability (OPC)	3,000 items max. per second Depends on the response speed of the connected device
Collection cycle (MELSEC Ethernet communication)	100 ms to 10 days
Collection capability (MELSEC Ethernet communication)	5 units max. at the same time 2,000 items in total
Collection cycle (via MELSEC high-speed logger unit)	10 s to 10 days
Collection capability (via MELSEC high-speed logger unit)	Trigger logging (1 ms cycle): A file of 20,000 data records can be collected on a 10-second cycle (fastest speed) Continuous logging (10 ms cycle): A file of 200,000 data records can be collected on a 1-minute cycle (fastest speed)
Data import (input task)	Comma-delimited text file Encoding: ANSI, UTF-8, UTF-16 Max. number of items per task: 200
Data export (output task)	Comma-delimited text file Encoding: ANSI, UTF-8, UTF-16
Collectable data type	Integer (2 or 4 bytes), real number (4 or 8 bytes), date, string (80 characters max.), boolean
History data capacity	1 TB max.
Number of clients connected simultaneously	30 max. (Professional Edition, Enterprise Edition, Site License) 10 max. (Standard Edition)

License

ePREXION server license

Basic model No.	Optional specs.			Name	Specifications
AZ-3EPX-					
	3C				ePREXION server R320
		E			English
			1	Standard Edition	40,000 items. Max. clients connected simultaneously: 10
			2	Professional Edition	100,000 items. Max. clients connected simultaneously: 30
			3	Enterprise Edition	100,000 items. Max. clients connected simultaneously: 30. Total number of clients: no limit
			4	Site License	100,000 items. Max. clients connected simultaneously: 30. Total number of servers/ clients: no limit

ePREXION client addition license

Basic model No.	Optional specs.				Description
AZ-3EPX-					
	C				ePREXION Client
		1			Fixed at 1 (reserved for future expansion)
			E		English
				01	1 added client
				05	5 added client
				10	10 added client
				15	15 added client
				20	20 added client

ePREXION optional license

Basic model No.	Optional specs.			Description
AZ-3EPX-				
	30			ePREXION R3xx
		E		English
			EV	Event History server license
			FS	High-speed data collection license
			RD	Redundant process history server license

–Memo–

"This product includes software developed by the OpenSSL Project or use in the OpenSSL Toolkit (http://www.openssl.org/)"

"This product includes cryptographic software written by Eric Young (eay@cryptsoft.com)"

"This product includes software written by Tim Hudson (tjh@cryptsoft.com)"

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