
Technical Information

Overview of Plant Resource Manager (PRM)



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Introduction

This document describes about Yokogawa's plant asset management software, Plant Resource Manager (PRM®) package, including its product value proposition, features, and functional overview.

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Overview of Plant Resource Manager (PRM)

TI 33Y05Q32-32E 2nd Edition

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1. Value Proposition of PRM

“A well-managed plant, I soon learned, is a quiet place. A well-managed factory is boring. ... because the crises have been anticipated and have been converted into routine.”

[An observation by Peter F. Drucker]

In 2006, Yokogawa Electric publicized the “VigilantPlant® Operational Excellence Model,” as shown below. A quiet, plain-looking, well-managed plant that produces maximum business results is the solution for an ideal plant. This business model consists of four elements: Production Excellence (PE), Safety Excellence (SE), Asset Excellence (AE), and Lifecycle Excellence (LE) shared in common. Realization of the ideal plant requires excellent conditions for managing and maintaining production, assets, and safety over the plant lifecycle.

The Plant Resource Manager (PRM) performs plant asset management (PAM) to manage plant asset information online, which is a key component to attain Asset Excellence (AE). PRM aims to improve operations and maintenance and optimizes the reliability and availability of plant assets by achieving greater predictability. PRM helps prevent downtime and reduces maintenance costs by helping both operators and maintenance people.



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Figure VigilantPlant Operational Excellence model

1.1 What is Asset Excellence (AE) ?

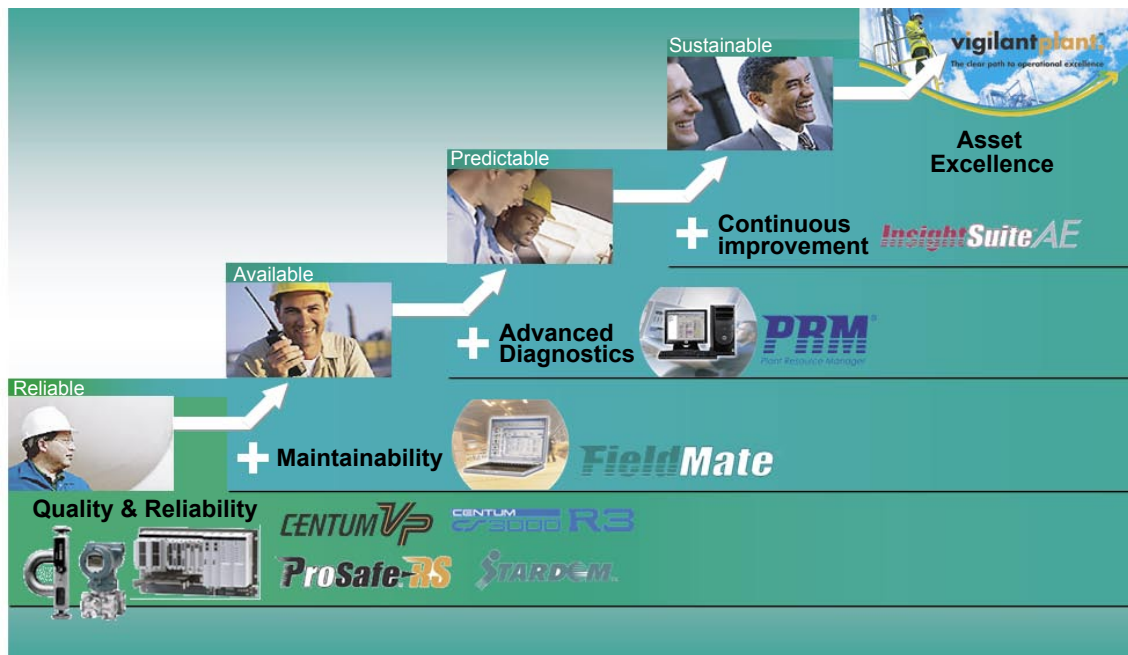
The improvement of productivity is the ultimate goal in plant operation. There are two categories to achieve this goal; maximization of production efficiency and optimized use of the plant assets through operation and maintenance activities.

Yokogawa released the world's first distributed control system (DCS), CENTUM, in 1975 and has continuously developing the best-in-class operation systems. Yokogawa's products range not only DCS but also field sensors such as flowmeters, differential pressure, pressure, and temperature transmitters; software packages for operational supports, advanced control, and operation efficiency improvement. All of these have been contributing for the automating the operations. Whereas the production facilities are maintained appropriately, the plant operation runs smoothly; however, the plant maintenance is supported largely by the efforts, experiences, and intuition of the expertise who are involved in.

For instance, a few decades ago, the conventional sensors transmitted a measuring value only in 4 – 20 mA analog signals from the field to DCS. Innovations in the field digital technology in the recent years made it possible for reciprocal communications between the DCS and the field devices. Intelligent functions of the field sensors and control valves enhanced the diagnostics.

Field digital technologies enabled intercommunications between the field devices and control systems, and also allowed remote online handling of field device parameters and diagnostic information other than control signals. Yokogawa offers a group of solutions by combining the hardware and software given below, named as AE Solutions as follows.

- Highly reliable hardware - sensors, control systems, and fieldbuses
- FieldMate – a field tool which facilitates the configuration of a single device, performs device operations such as changing parameters, maintenance, and diagnostic function.
- PRM – a tool which allows extensive remote status supervision for plant facilities from the central control room, and performs device operations, such as changing parameters, maintenance, and diagnostic functions as well.
- Value-added service activities - proposed and implemented by deeply involved in user plants for the improvement of their plant operations.



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Figure The Clear Path to Asset Excellence

1.2 Advantages of Introducing the AE Solutions

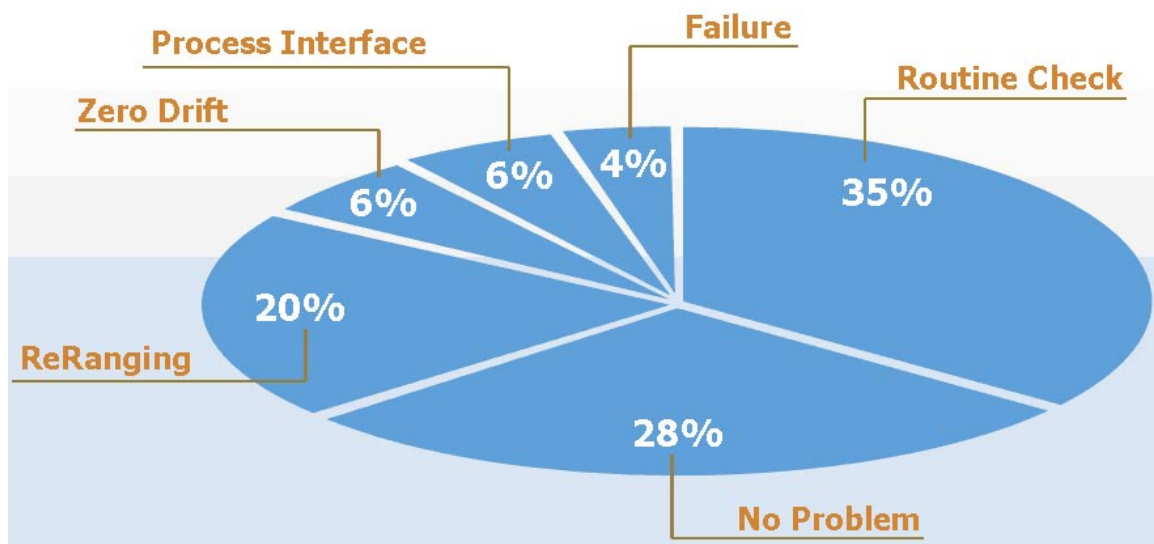
Users are benefited by introducing the AE solutions as described below.

■ Reduction in financial losses caused by unexpected failures

A predictive diagnosis is one of the AE solutions. It enables to detect a device failure in advance. For example, a diagnosis of an impulse line blocking of a differential pressure transmitter notifies operators that the line is about to clog before it is completely blocked. By conducting the scheduled maintenance work before the plant fails enables uninterrupted plant operation. These things largely contribute to the prevention of plant's operational losses, securing plant safety, and environmental conservations.

■ Reducing unnecessary and non-urgent maintenance

The figure below shows the statistical survey result of time spent on maintenance work for instrumentation in the chemical industry. And 63% of the total maintenance work is occupied by "Routine Check (i.e. a conventional check of instrumentation)" and "No Problem (i.e. no problems were found in the instrumentation)." In other words, too many hours are spent only to confirm that there is no problem with the instrumentation.



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Source: Hydro Carbon Engineering, April 2004

Figure Time Spent on Maintenance Work for Instrumentation

The diagnostic and the predictive diagnosis functions of field devices (i.e. sensors and valves) used by AE solutions made it possible a shift from time-based maintenance (TBM) into condition-based maintenance (CBM) for conventional field devices. These functions also drastically reduce the time spent on maintenance work while sustaining plant safety high. In addition, PRM's remote monitoring reduces number of trips and its travel time needed for routine check or alarm acknowledgement in the field.

1.3 Collaborating with Third-Party Equipments via Open Interface

The AE solution aims to achieve high reliability in plant operations. This is not easy to accomplish as there are varieties of equipments other than Yokogawa DCS and sensors, for instance, control valves, rotating and reciprocating machineries that incorporate motors and inverters in an actual plant. To improve the reliability of the entire plant, centralization of plant-wide asset management and diagnostic functions is essential. Yokogawa offers an integrated service of the plant-wide asset management and diagnostic functions not only for Yokogawa equipments but also for the third-party equipments. Yokogawa's AE solutions adopt an international and industry standardized open interface such as FDT/DTM (*1) or OLE for Process Control (OPC) as key technologies to achieve such integration. Having alliances with leading manufacturers in each field, PRM is a platform to achieve this integrated solution via open interface.

*1: FDT/DTM (Field Device Tool/Device Type Manager)
FDT is an open device management interface technology. This technology is applied to uniformly handle an application program of DTM which conducts parameter setting, tuning, and self-diagnosis of various field devices.

■ Valve Solution

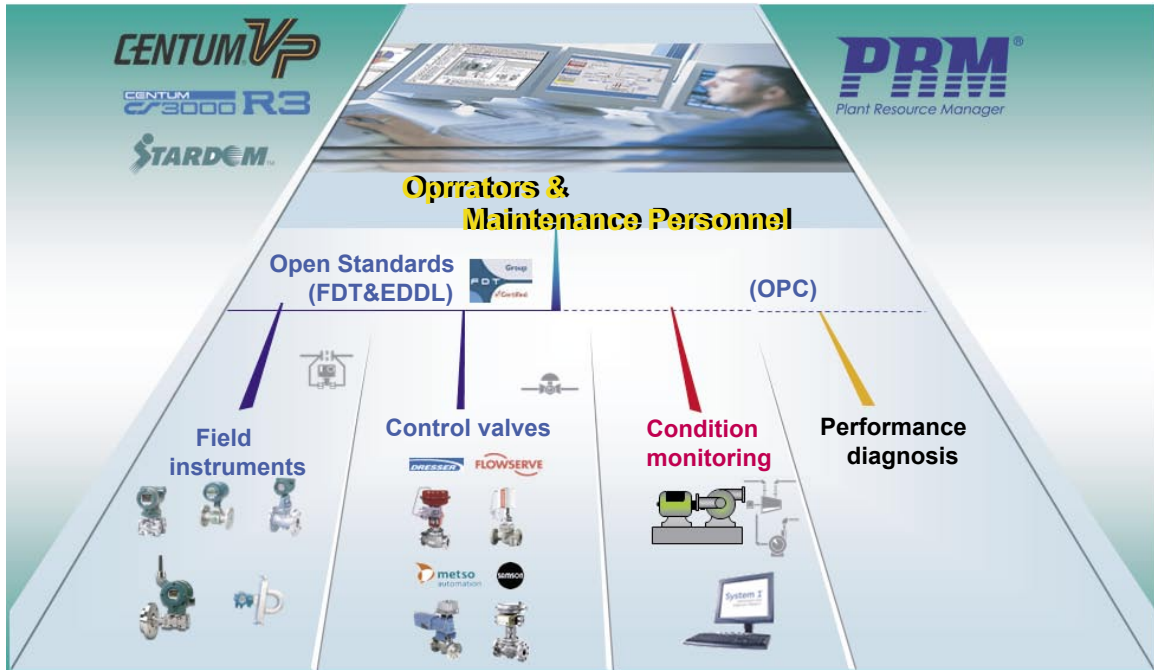
Yokogawa has alliances with four global valve vendors under the VigilantPlant Integration Partnership (VIP) program. By integrating these valves using the FDT/DTM functions, PRM is able to perform high quality device management and diagnosis other than the valve positioner configuration.

■ Diagnosis solutions for rotating and reciprocating machineries

Yokogawa offers a solution for machinery diagnosis via an OPC interface in association with GE Energy, the world's leading manufacturer of the rotating and reciprocating machinery diagnosis. GE Energy's System 1® is a machine/asset status supervision and diagnostic software platform, enabling to supervise equipment status, diagnose rotating and reciprocating machines, and optimize plant operations. With this function, PRM can display the status of motors and pumps in addition to the control and instrumentation equipments as well as System 1's detailed status display of the asset conditions. When the machinery fails or predictive alarms are generated, System 1 sends messages to DCS via PRM to notify operators.

■ Interoperability

Users are concerned if the devices from different vendors can perform normally, especially when the intelligent devices are involved. To eliminate such concerns, Yokogawa set up the FDT/DTM interoperability test laboratory to conduct interoperability tests of the devices. This laboratory verifies if the DTM of the valves from the VIP partners works normally in combination with PRM and FieldMate, and publicizes the test results to convince the users of the interoperability.



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Figure Valve and Rotary Machine Diagnostic Functions by Open Standards

2. Features of PRM

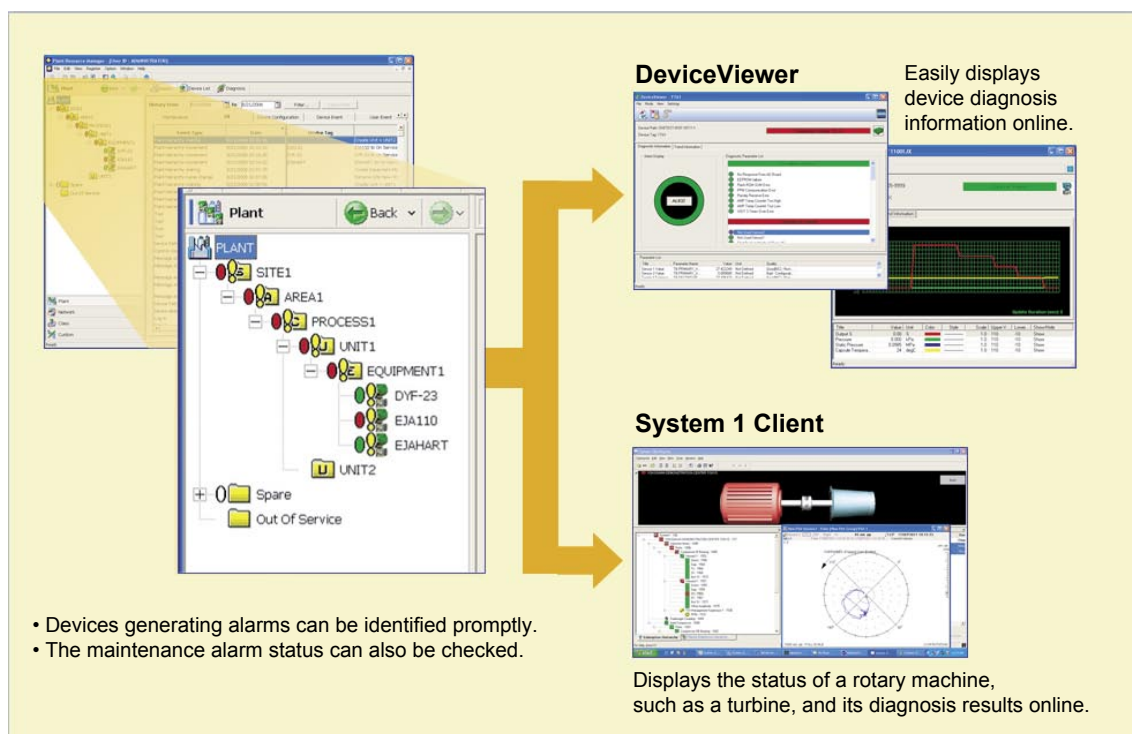
PRM is the device management software with following features.

2.1 Centralized Monitoring of the Plant Equipment

The plant management system can be categorized into two systems: Enterprise Asset Management (EAM) and Plant Asset Management (PAM). PRM performs periodical or real-time status monitoring of various plant equipments, which is the core of PAM. Other than fieldbus (*1), PRM interfaces with third-party diagnostic functions and performs centralized status monitoring for environmental instruments such as flowmeters and valves as well as mechanical instruments such as rotating and reciprocal machineries. PRM displays the device and equipment statuses and alarms and events in the plant in an explorer-like tree view in accordance with the plant hierarchy and network configuration. PRM displays summary and individual information of the devices and equipments in the plant's higher-hierarchical levels, which allows operators and maintenance people to obtain the plant's equipment and instrumentation status at a glance. In case a failure occurs, PRM calls up the status display of the failed equipment and notifies the event (by generating a maintenance alarm) to operators and maintenance people including the details of the failure, causes, and countermeasures.

*1: PRM supports the following field digital protocols:

- FOUNDATION fieldbus H1
- HART
- ISA 100.11a Wireless
- PROFIBUS-DP/PA

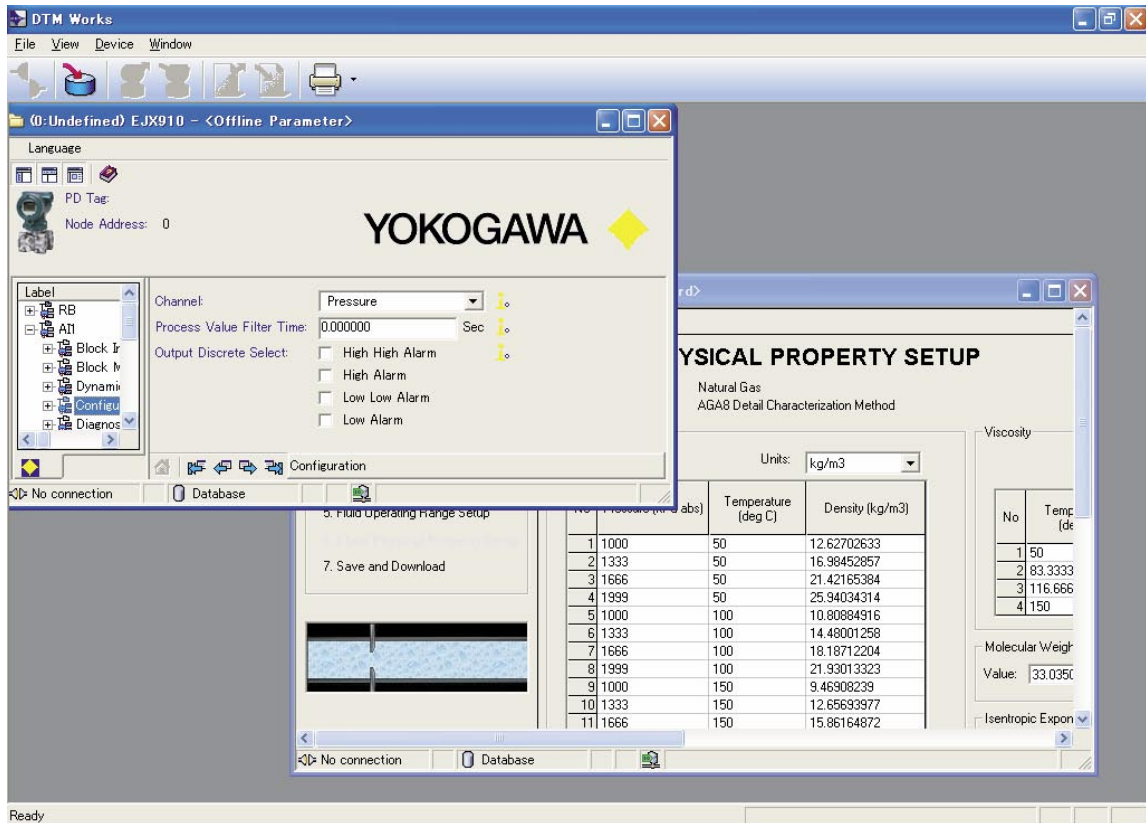


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Figure Centralized Monitoring of Plant Equipment in PRM

2.2 Device Adjustment Tools

PRM corresponds to both EDDL (*1) and FDT/DTM (*2) as interfaces with field devices, so that PRM is able to apply DTM with a user-friendly graphical user interface (GUI) provided by many device vendors. PRM employs the same user interface with FieldMate which is a device adjustment/parameter setting, and it enables remote device adjustment in the same manners as in the field. In addition, PRM manages device setting, adjustment, and operation logs which are performed by FieldMate using the PRM-FieldMate synchronization function. The PRM client also sets and adjusts devices using tools supplied by device vendors as a PLUG-IN application.



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Figure Example of DTM Display Screen in PRM (FieldMate)

- *1: EDDL stands for Electronic Device Description Language which describes the characteristics and attributes such as manufacturer names, model names, and measuring ranges of field devices such as transmitters and valves.
- *2: FDT stands for Field Device Tool and it is an open device management interface technology. DTM stands for Device Type Manager which is an application program that runs on the FDT. DTM performs parameter setting, tuning, and self-diagnosis of various field devices.

2.3 Diagnostic Functions towards Predictive Maintenance

PRM processes various diagnoses and integrates those diagnostic results that are related to the plant equipments. The diagnostic types are divided into three categories as shown below.

- (1) Diagnosis carried out by devices or equipment
- (2) Diagnosis carried out by acquiring data from devices or equipment
- (3) Diagnostic solutions provided by other companies such as GE Energy's System 1 for rotating equipments and reciprocal machines.

The diagnosis results carried out by the devices or equipments are stored in PRM as device-related data via fieldbus, and displayed on the status display icon. Loop or equipment diagnoses are performed based on the data acquired from the devices and equipments. PRM also displays the diagnostic results obtained via other companies' diagnostic solutions through an open interface. By utilizing the data accumulated in PRM, diagnostic algorithms can be developed.

In these manners, PRM can be applied as the platform of diagnostic functions, and the accumulation of the diagnostic data enables to shift the current breakdown maintenance (BM) into preventive maintenance, or even into the predictive maintenance.

2.4 Centralized Asset Management

PRM stores all alarms and events, diagnostic results, operation and maintenance records, and parameter and parameter change histories in its database. Using the synchronization function with FieldMate, PRM also integrates initial settings of the device parameters and historical records of the device adjustments in the field. These functions help operators and maintenance people know device status changes and historical records of failures to make plans for plant operation and maintenance. For instance, operators can short list the devices that failed frequently out of the alarm histories in the database. A trend monitoring of the devices' deterioration parameters or their comparison with thresholds, and device's operating records can be used as a guideline to select devices and equipments that need maintenance. The saved parameters or other devices' parameters can also be used for inspections and adjustments.

3. Functional Overview

PRM is equipped with device information and its historical record management functions as well as the device adjustments functions as described below.

■ Device Management Function

Manages device-related information. The device navigator displays information of devices and equipments scattered around the plant. It also displays the device and equipment statuses which enables operators and maintenance people to understand the plant asset status. The device master contains information such as date of deliveries of the devices and equipments as well as user-defined items. PRM centralizes all the device and equipment information.

■ Alarm Notification Function

PRM handles and generates alarms to notify operators and maintenance people by acquiring alarms transmitted from intelligent devices or setting alarm conditions. PRM adds attributes of the alarm information such as priority information, and notifies those alarms to operator stations of the CENTUM VP/CS 3000 integrated production control system.

■ Audit Trail Management

PRM manages device events which are changes in device setting and alarms. All these events are displayed in the history window. Searching and filtering functions are available by the equipment or device conditions.

■ Device Adjustment Function

PRM displays, changes, and stores intelligent device parameters online. PRM complies with FDT/DTM and launches device DTM created by the device vendors.

■ Maintenance Support Work

PRM is equipped with other useful functions in device management such as inspection scheduler, inspection record manager, spare parts manager, and document register.

3.1 Device Management Functions

PRM centralizes management of device-related information. Followings describe how PRM displays and manages device-related information.

3.1.1 Configuration of PRM Windows

The PRM is comprised of two main display windows – the device navigator and the functional window. Select devices by the device navigator and display and set the device information by the function window.

■ Device Navigator

PRM displays the registered devices in an explorer-like tree view. Devices can be displayed in several ways such as in accordance with the plant structure or in the network configuration. The device navigator helps operators to grasp the plant status and configuration at a glance.

■ Function Window

Through the main window, PRM functions are executed. Different screens are provided suitable for each purpose such as to show devices selected by the device navigator or to execute the selected function.

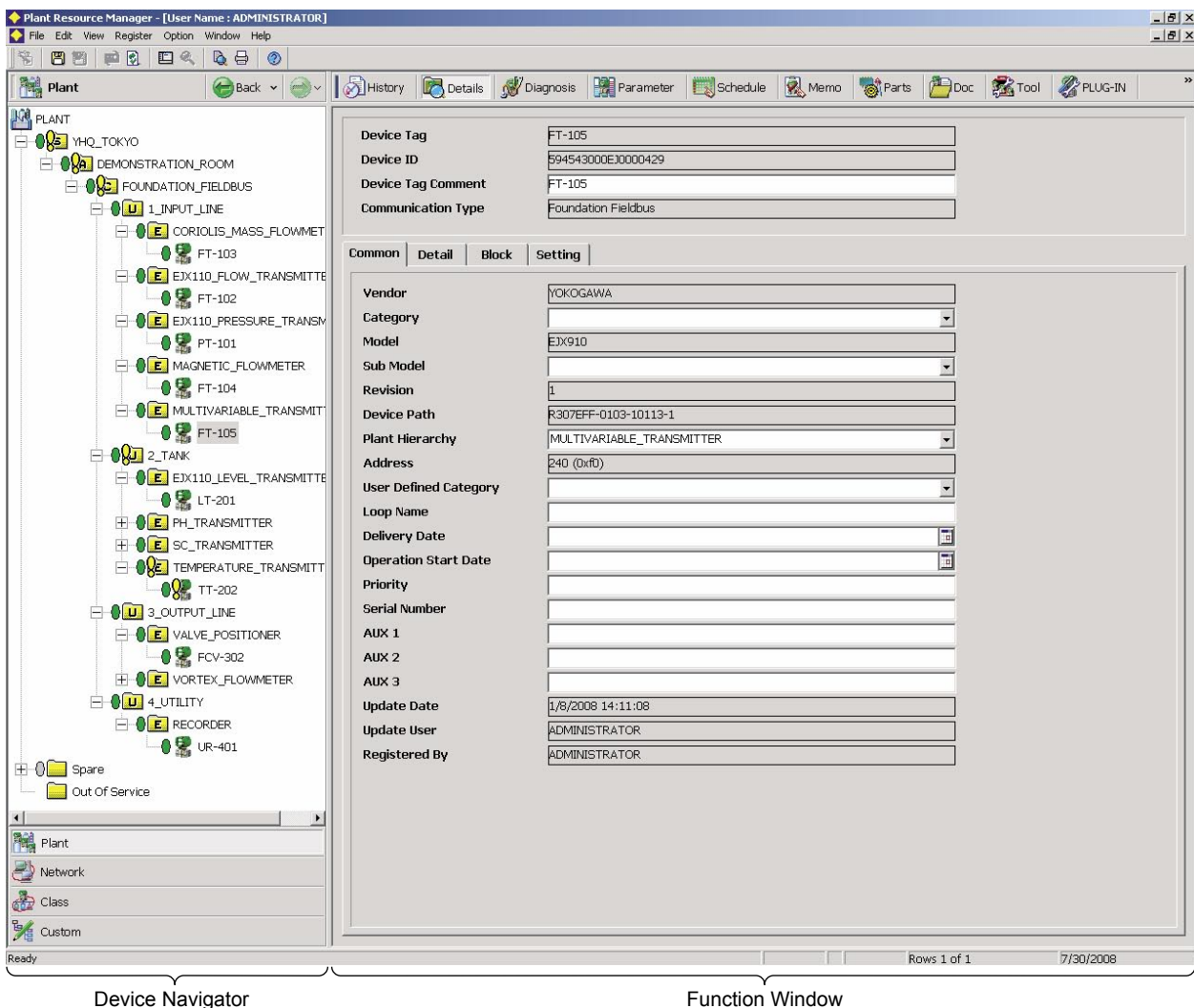


Figure PRM Window Configuration

3.1.2 Device Navigator

The device navigator displays devices registered in PRM in an explorer-like tree view. Four views, which can be switched at any time, are provided to manage a plant as shown below.

■ Plant View

Displays a logical arrangement of devices and equipment in a plant. It enables users to find out the plant equipment status by its location or by the process unit by configuring the equipment model based on the ISA S88.01 standard.

■ Network View

Provides displays in accordance with communication protocol or communication path. When the FOUNDATION fieldbus-H1 is used, it displays the location of the communication module and the communication paths corresponding to the fieldbus segments.

■ Class View

Devices are displayed by the vendors and the models (types). A template for each field device model is provided, which is effective in setting relevant documents for the same type of the devices for common use.

■ Custom View

This explorer-like tree view can be freely configured to display and manage user-defined information by the maintenance schedule, or by persons in charge, and so on.

3.1.3 Status Display

The device navigator provides plant status information at a glance. It also displays the device alarm status whether those are acknowledged or not. This function provides users an instant overview of the plant equipment status.

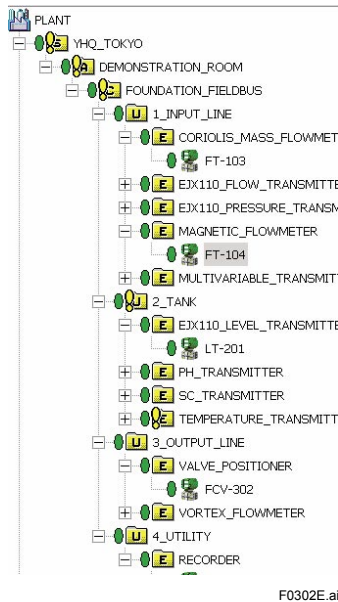


Figure Status Display Screen

■ Device Alarm Status

Status display icons are shown for all the devices registered to the device navigator. Colors of the icon indicates the status of the devices such as [normal], [abnormal], [communication network failure], or [status unknown], to enable operators to judge at a glance if the device is functioning normally or not. The abnormal status of the device can also be observed from the upper-level folders so that the scope of influences can be determined. Or, the failures can be tracked down from the upper-level of the plant hierarchy to the lower-level to identify where the failure occurred and what caused the failure.

■ Unacknowledged alarms

If there is an unacknowledged maintenance alarm, an icon appears on the device navigator. The unacknowledged alarm icon can also be identified from an upper-level folder so that an operator can instantly spot out where the unacknowledged maintenance alarm is occurred.

■ Device Usage State

Device usage state can be found on the device navigator such as [in service] while it is in operation in the plant, [spare] as stored as a spare, or [out of service] when it is not in use for repairing or other reasons.

3.1.4 Device Master

Detailed device information is listed in the device master. In the device master, static information, such as addresses, device names, and the like, is described for management. Users can display a list of items of information stored in the device master. Users can also display individually detailed information on a per device basis. Items of information to be managed in the device master are as follows:

■ Device Information

This is the static information that intelligent devices have. As for FOUNDATION fieldbus-H1 devices, the resource block information applies to this category.

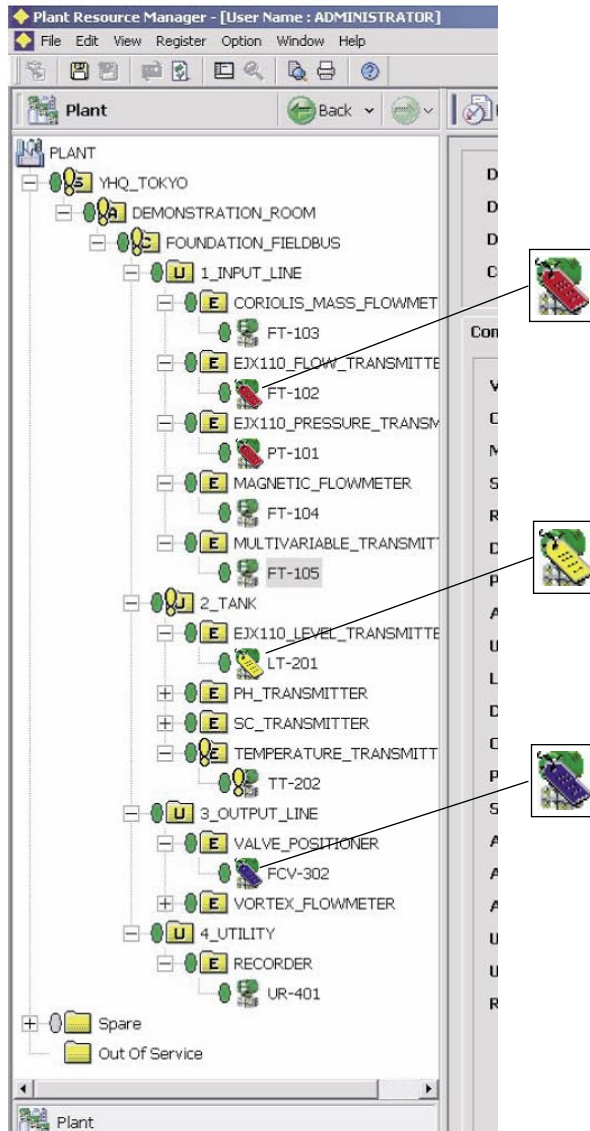
■ Registration by Manual Entry

It is possible to add other user-required device information by manual entry. For example, the users are able to include important information such as delivery date of the device or the priority of the device. Users can also create user-required items as necessary. The same information can be registered not only for intelligent devices such as FOUNDATION fieldbus-H1 and HART devices but also for conventional devices and plant equipment.

3.1.5 Maintenance Mark

PRM is able to electronically assign maintenance mark to each device. The maintenance mark icon for each device appears on the device navigator when it is assigned. Operators and maintenance people can set and adjust the operation/service status of the devices online. By assigning the maintenance mark, it temporarily changes the device restrictions.

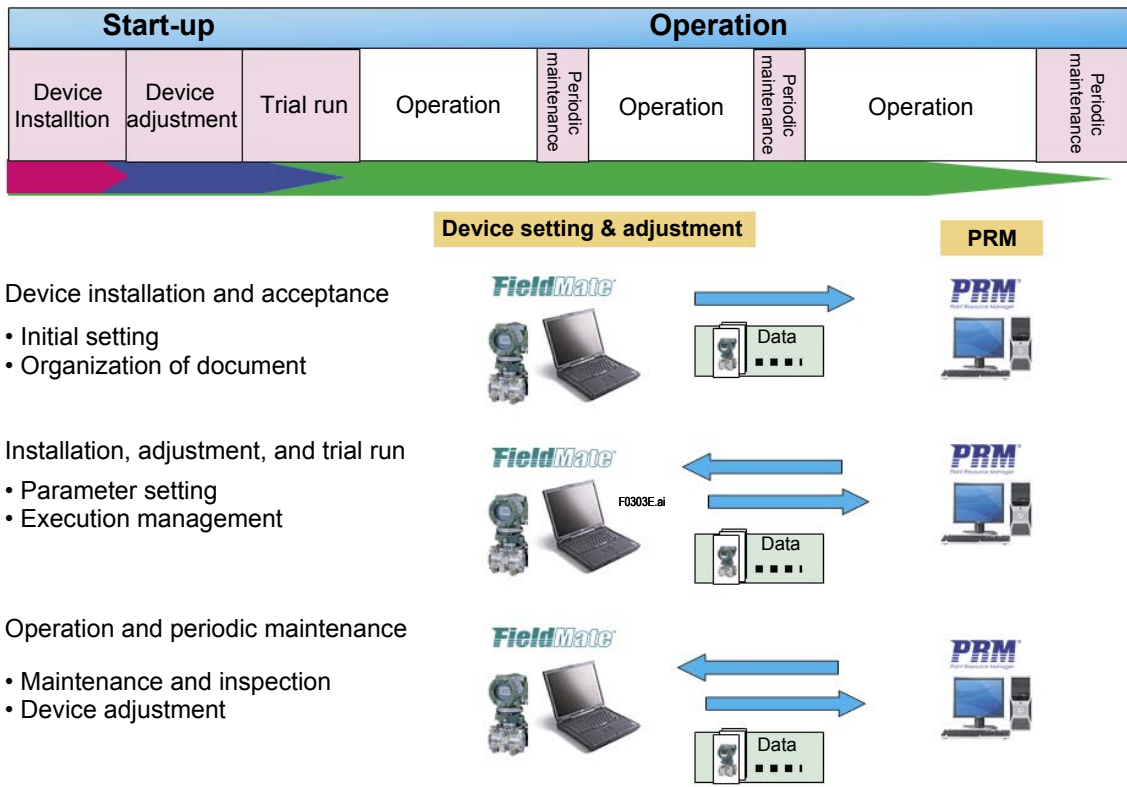
By linking it with CENTUM's operation mark on the faceplate, the maintenance engineers and the operators can share the same information and coordinate their work as well.



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3.1.6 Synchronization with FieldMate

FieldMate is a software tool for setting and adjusting field devices complying with various digital communication protocols. The FieldMate sets and tunes device parameters of the various communication protocols by using a note PC, instead of using portable terminals that have been required for each communication protocol. PRM takes in all the information that FieldMate obtained such as parameter setting, parameter tuning, and operation logs into its database to centralize device management. Moreover, the parameter settings stored in the PRM can be downloaded to FieldMate and utilize them during the plant maintenance or replacement of the devices. Throughout the plant life cycle, PRM provides an optimized environment for device adjustment and database management via the synchronization function with FieldMate.



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Figure Field Device Data Centralized Management with PRM

3.2 Diagnostic Functions

PRM displays the results of self-diagnosis or diagnoses done by the third-party systems. Referring to the device parameters, PRM diagnoses the device and its ambient status. Then, the diagnostic information will help predict the failures in the equipment, which is the way to achieve predictive maintenance. PST scheduler performs partial stroke tests (PST) for the emergency shutdown (ESD) valves and the results are handled by the PRM.

These diagnostic functions help improve the plant's productivities, and it provides fundamental information to stabilize the plant operations in the optimized state for as long as possible. It optimizes the asset operation and maintenance in order to decrease the maintenance cost such by improvement in equipment operability brought by the stabilized production process and maintenance costs.

3.2.1 DeviceViewer

DeviceViewer shows details of the device statuses. It also displays self-diagnostic results of the FOUNDATION fieldbus-H1 and HART devices, and the device parameters are shown in the trend graph format. DeviceViewer is comprised of two tab sheets: diagnostic information and trend information. The details of the device information items can be defined by the definition file and it differs by each device. When there is no definition file, only the common information is displayed.

■ Diagnostic Information Tab Sheet

An example of the diagnostic information tab sheet is as shown below.

The screenshot shows the 'DeviceViewer - TT-202' application window. At the top, it displays the device path 'R307EFF-0103-10113-1' and device tag 'TT-202'. A red bar indicates 'Transducer Status - Error'. The 'Diagnostic Information' tab is active, showing an 'Alarm Display' with a green circle labeled 'AL050' and a 'Diagnostic Parameter List' with items like 'AMP Temp Counter Too High', 'AMP Temp Counter Too Low', and 'WDT 3 Times Over Error'. A 'Transducer Status' bar is also present. Below is a 'Parameter List' table.

Title	Parameter Name	Value	Unit	Quality
Sensor 1 Value	TB01.PRIMARY...	25.990734	Not Defined	Good(NC) - Non...
Sensor 2 Value	TB01.PRIMARY...	25.711435	Not Defined	Bad - Sensor Fai...
Terminal Tempera...	TB01.SECOND...	25.684399	Not Defined	Good(NC) - Non...
Differential Value	TB01.DIFFERE...	0.279297	Not Defined	Bad - Sensor Fai...
Average Value	TB01.AVERAG...	25.951084	Not Defined	Bad - Sensor Fai...
Backup Value	TB01.BACKUP...	25.990734	Not Defined	Good(NC) - Non...

Figure Diagnostic Information Tab Sheet for DeviceViewer

The diagnostic information tab sheet consists of a device information area, a diagnostic information area, and an additional information area.

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- **Device Information Area**

The selected device status is displayed in color. The device status reflects the results of the diagnostic information alarms and device communication status shown in the diagnostic information area. Any one of those fails, the device status is shown as failure.

- **Diagnostic Information Area**

Multiple diagnostic items are displayed individually in colors. It helps operators to determine what caused the device failure by referring to the items that indicates failures.

- **Additional Information Area**

The parameter information of an intelligent device is displayed in a table.

■ Trend Information Tab Sheet

Parameter trends of a device can be displayed randomly. The acquired parameter can be exported in the CSV format.

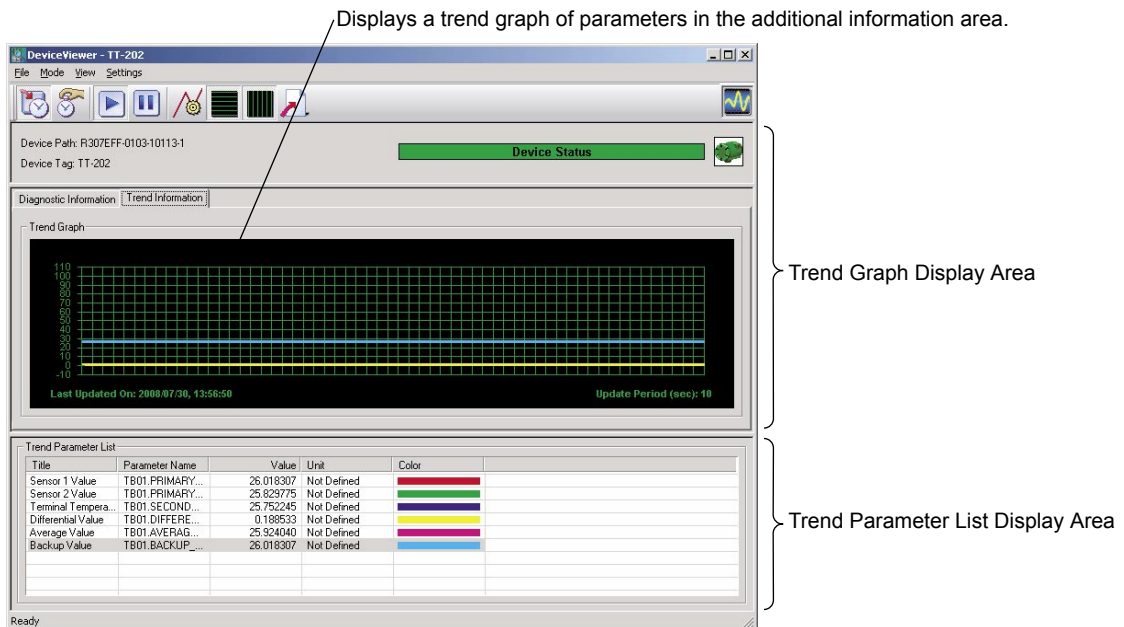


Figure Trend Information Tab Sheet for DeviceViewer

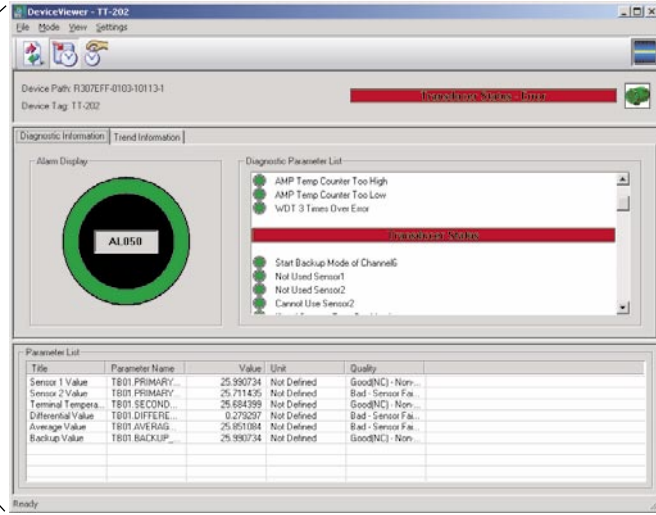
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■ **Launching PRM on CENTUM VP/CS 3000**

The DeviceViewer can be called up from and displayed on the CENTUM's operator station by clicking its faceplate. This function helps operators to identify if the failure is caused by the device or the process.



Operator Station (HIS)



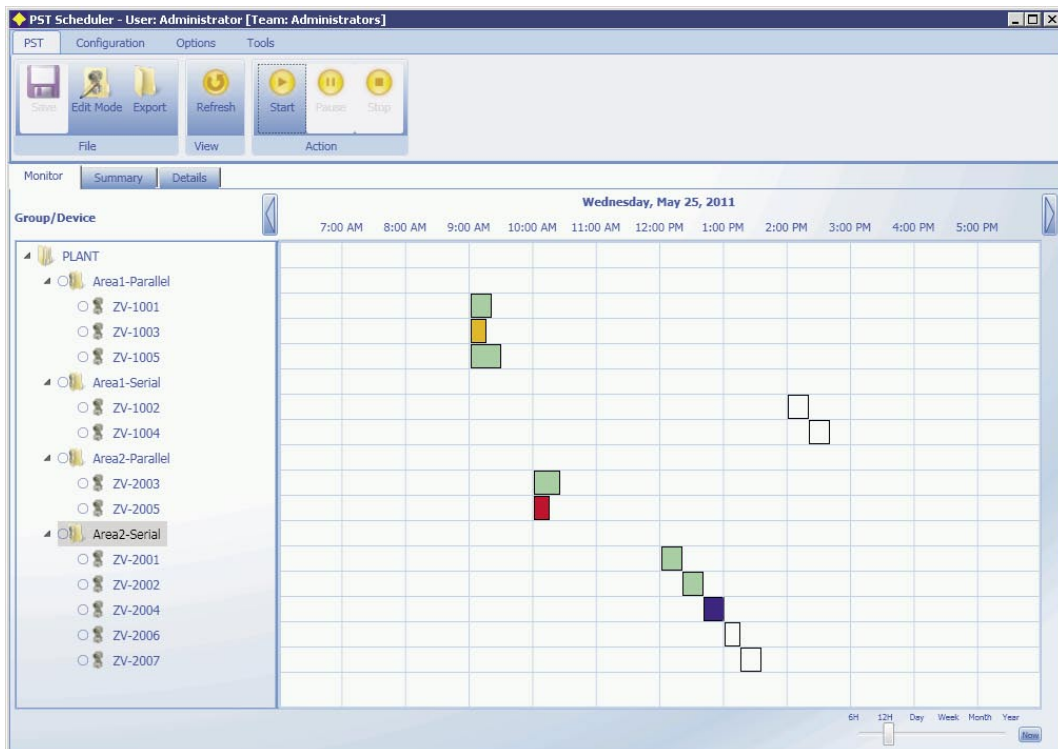
Field Device Status Display (DeviceViewer)

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3.2.2 PST Scheduler

It is mandatory to perform full stroke tests (FST) during plant shutdown for emergency shutdown (ESD) valves at certain intervals to ensure they are functional. On the other hand, a partial stroke test (PST) can be performed online by slightly operating ESD valves while the plant is running. By conducting PSTs, it is possible to extend the intervals of the FSTs, thus the plant operation time can be maximized.

The PST Scheduler function allows scheduling the PST periodically by weekly, monthly, or annually, and it performs PST automatically or semi-automatically with acknowledgement by the operators. The PST schedules can be changed after those are scheduled. The PST can also be performed manually or on demands. PRM displays the test schedules, test status in progress, and the test results in the Gantt chart format with status colors. PRM integrates and centralizes the PST related information.



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- **User Management**

User account can be created independently from the PRM systems by defining an individual user or a group of users as a team. The user role defines and restricts the level of access and responsibilities.

- **PST Group**

PST Scheduler organizes the ESD valves into groups. Up to 100 ESD valves can be registered to a PST group and up to 100 PST groups can be generated.

- **Device Type Manager (DTM)**

By launching DTM provided by the device vendors, PST Scheduler displays device parameters and PST performance status.

- **Operator Guide Message to CENTUM HIS**

PST Scheduler transmits operator guide messages to CENTUM human information station (HIS) notifying PST is started, ended, or other messages.

3.2.3 Integration with GE Energy's System 1

PRM allows online monitoring of field devices connected via fieldbus. In addition, PRM realizes monitoring of plant equipments by connecting diagnostic functions supplied by other companies via a standard interface (OPC interface). PRM monitors operating status of a rotary machine which is one of the important equipments in a plant, along with instrumentation devices, in association with System 1 from GE Energy. System 1 is a machine/asset condition monitoring and diagnostic software platform which supplies rotary and reciprocating machine condition monitoring and diagnosis as well as optimum plant operating functions. PRM captures the equipment information managed by System 1, and displays them on the PRM navigator screen in the same manners as other field devices. From the PRM navigator screen the System 1's detailed screens can be called up. PRM also receives alarms and events that System 1 generates that occurred among the equipments managed by System 1.

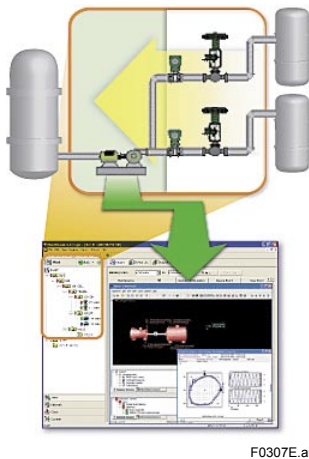


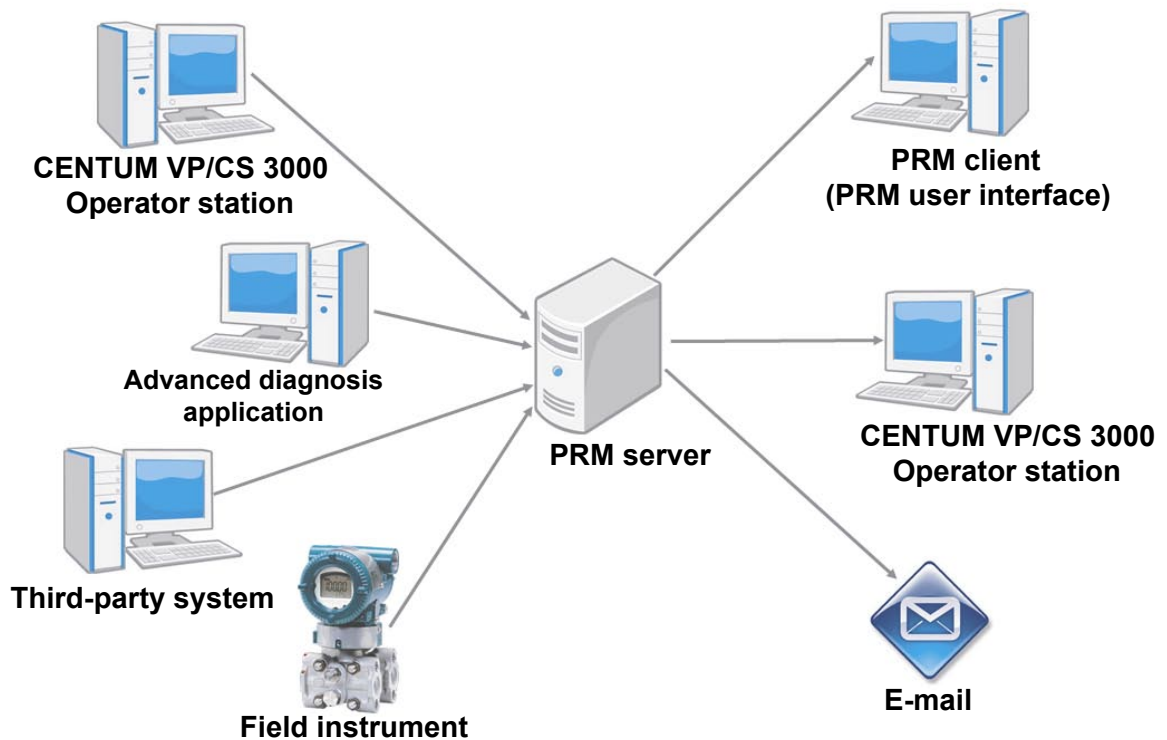
Figure Integrating the System1's equipment information with PRM

3.2.4 Advanced Diagnosis

PRM advanced diagnosis function acquires parameters of the fieldbus devices, detects failures of the devices and those related equipments, and improves the maintenance efficiencies. For instance a valve positioner advanced diagnosis function acquires the number of valve strokes to let maintenance people determine when to replace the valves.

3.3 Maintenance Alarm

PRM acquires alarms from devices as events and notifies them as maintenance alarms to the users based on the preset conditions. These alarms and events information includes messages from the CENTUM VP/CS 3000 systems, advanced diagnostic information, information from third-party systems, and manually entered information other than information from field devices. PRM selectively sent the acquired information to users as maintenance alarms based on the predefined filters. When the acquired information is classified as the maintenance alarms, it is notified to the user with priority level and other helpful information to identify the cause of the failure and countermeasures. Moreover those maintenance alarms can be shared with the CENTUM VP/CS 3000 operator stations as operator guide messages or send e-mails to relevant people.



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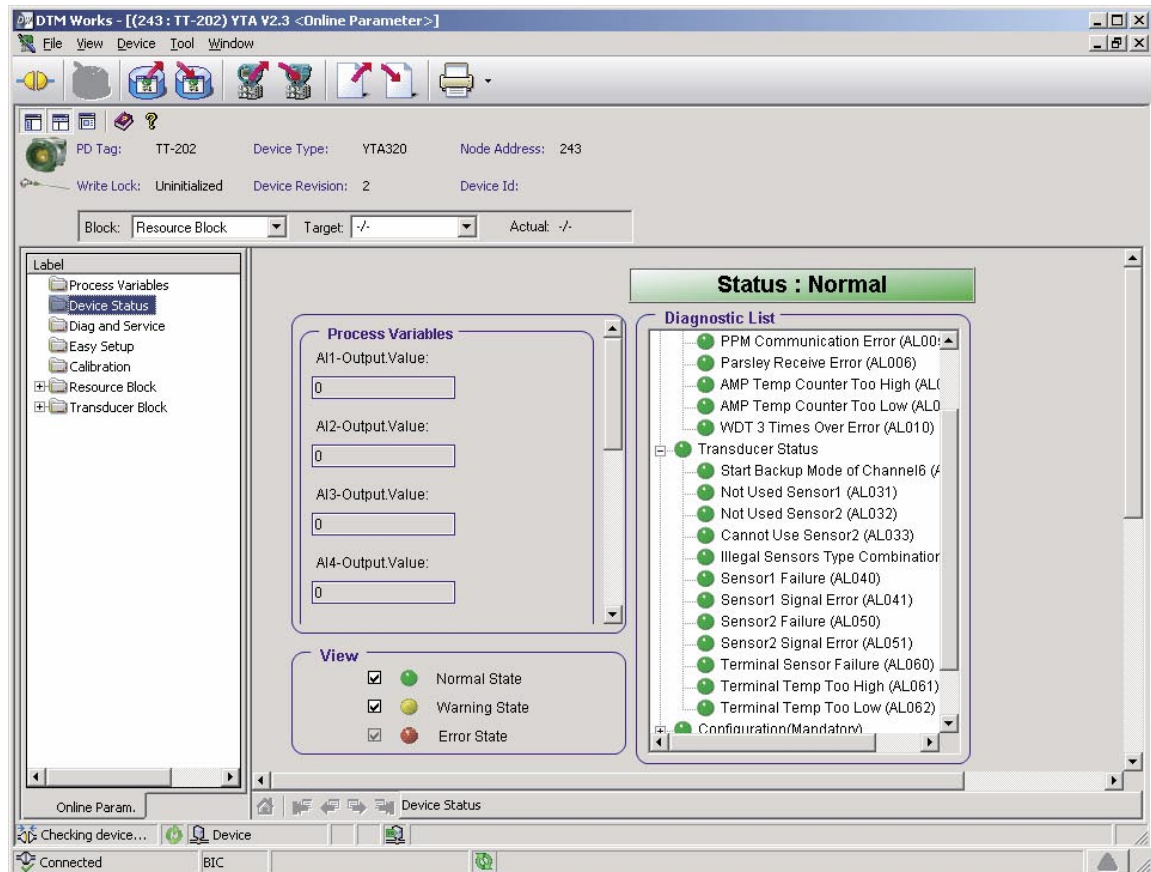
Figure Alarm Notification Flow by PRM

3.4 Device Adjustment Function

PRM allows online device adjustment. The device adjustment function such as DTM and parameter manager has the same user interface with FieldMate.

3.4.1 DTM Works

PRM supports DTM. PRM can launch device DTM; display and modify those device parameters; and perform device diagnosis and adjustment. DTM is an open technology tool for parameter setting for the field network, allowing users to utilize elaborated settings and free GUI of the DTM-compliant devices.

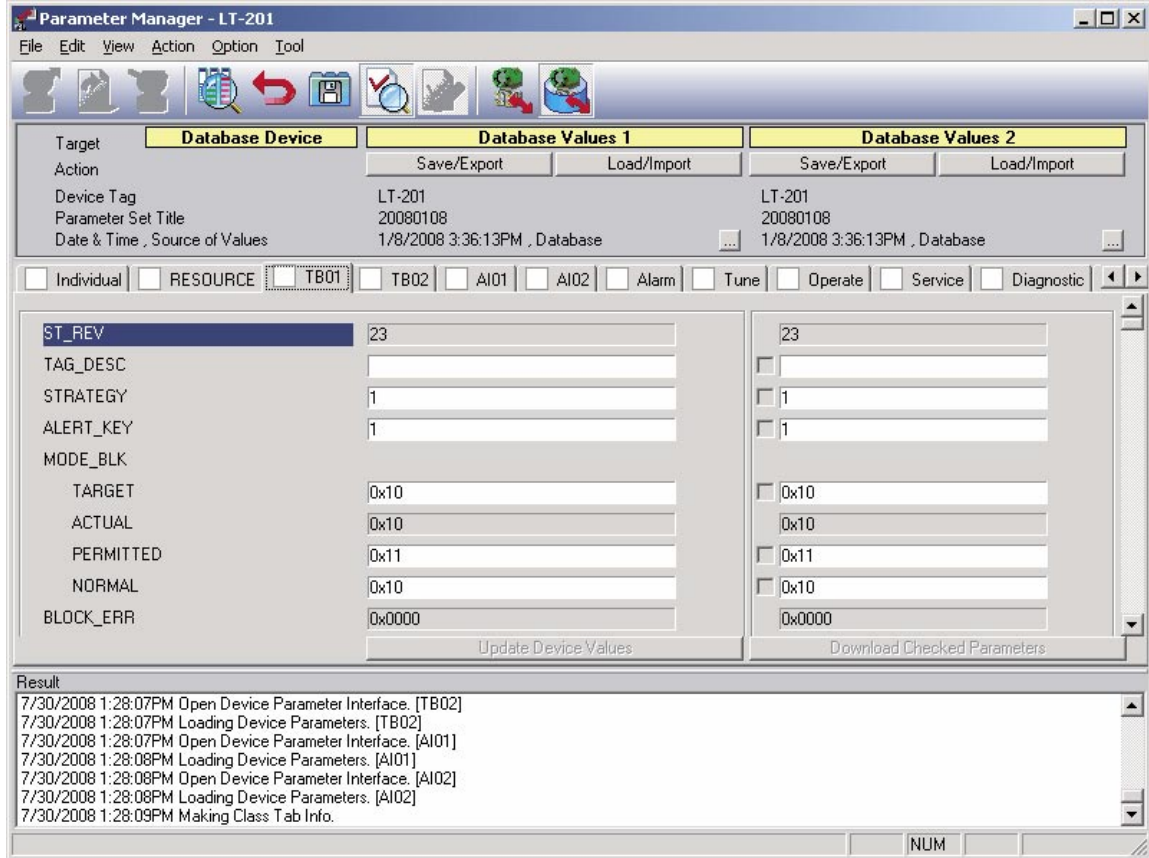


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Figure Example of a DTM Screen

3.4.2 Parameter Manager

Parameter manager acquires or modifies intelligent device's parameters online. Device parameter acquisitions and modifications can be done arbitrarily. Change parameters can be done to an individual device or the saved parameters can be uploaded to the devices at a lump.



F0309E.ai

Figure Parameter Manager

3.4.3 PLUG-IN Applications

PRM adopts and runs a third-party diagnostic and adjustment software tool as a PLUG-IN application. PRM launches the PLUG-IN application and saves its operation history, such as start and stop, as operational record messages. Yokogawa, for instance, provides ValveNavi™ YVP Management Software for setting up and maintenance of the YVP advanced valve positioner.

3.5 Audit Trail Functions

PRM manages device-generated events. The device parameters can be saved, and the past and the present parameters can be compared.

3.5.1 Event Management

PRM stores device-generated or user-conducted events as historical data. Historical data are displayed by selecting the devices by the device navigator.

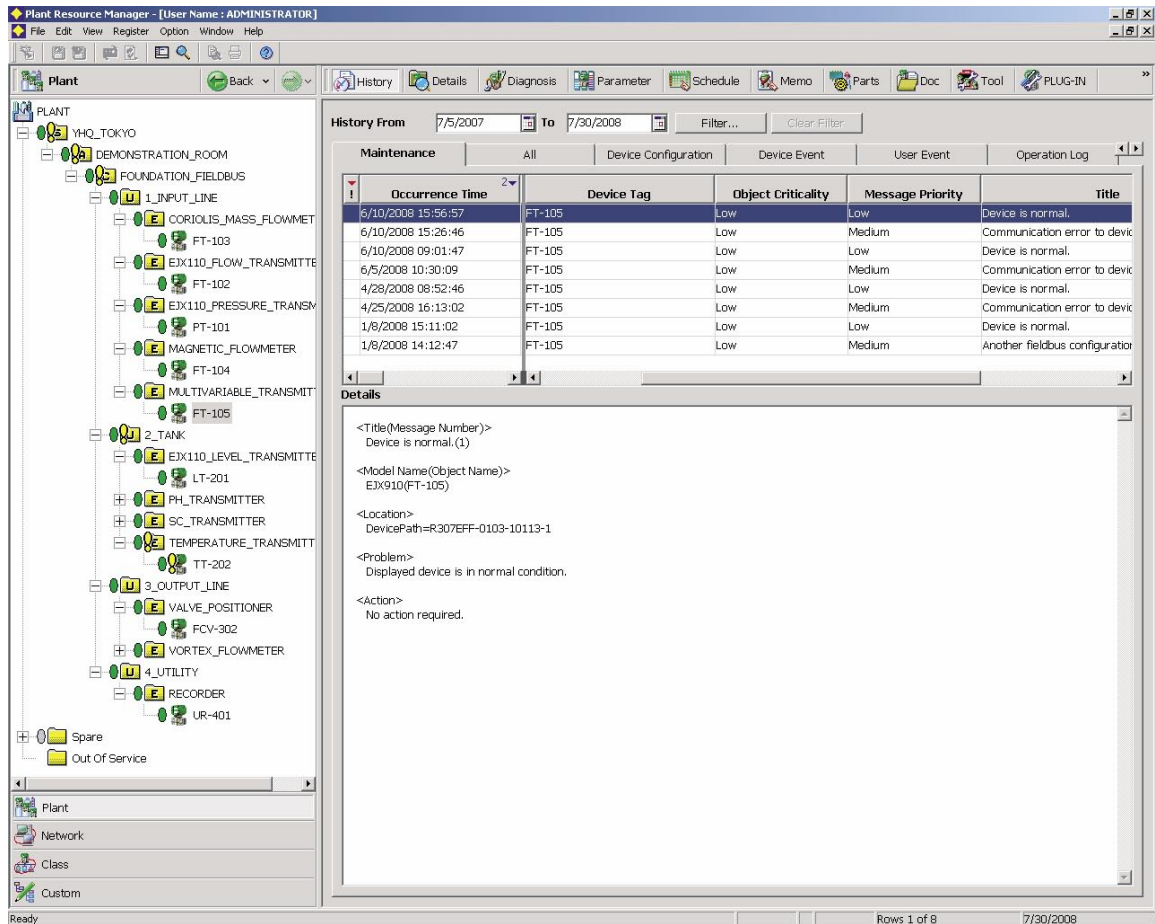


Figure Event Screen

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PRM acquires and displays events by the following categories.

Table Event Message Categories

Maintenance alarms	Messages acquired from field devices, advanced diagnostic applications, third-party systems, and CENTUM VP/CS 3000
User events	Log in, log out
Operational history	Device registration (add/delete devices, change device names), plant hierarchy creation, device assignment to the plant hierarchy, parameter group storage, setting user and user group registration, master data import/export
Device settings	Parameter setting/saving, calibration records, operation using PLUG-IN applications, inspection records, spare parts registration, setting inspection schedule and software download
Device event	Device events
PAS event	CENTUM VP/CS 3000 messages when the device tag is not specified.
Diagnosis	Start/stop diagnosis and event acquisition navigator, install/uninstall PRM advanced diagnostic application, start/stop/reboot/delete diagnosis, start diagnostic tool, failure detection
System	Event display of the resident programs that configures PRM system

3.5.2 Parameter History Management

PRM stores the device parameters in its PRM server for audit trail management. Both individual and bundled devices parameters can be stored at a time. PRM compares the stored parameters with the current parameters, between the same devices at different time stamps, or among the same type of devices. Or, the current device parameters can be modified based on the parameters stored in PRM.

3.5.3 Device Diagnostic Data Historian

The device diagnosis data historian function acquires data from field devices and an OPC server and stores them in chronological orders. Stored data can be used in a diagnostic algorithm study and for analysis.

3.6 Auxiliary Maintenance Work Function

PRM manages and utilizes device maintenance information to enable maintenance work more efficiently. PRM manages functions such as the device master, inspection memo, inspection schedule, parts list, and link to documents.

3.6.1 Inspection Memo

PRM accepts and saves device inspection records as maintenance information. Among those inspection records, the ones with approval by an authority are managed under the audit trail function. A PRM Client displays the inspection records by an individual device as well as to show detailed data.

3.6.2 Inspection Schedule

PRM performs the device inspection, defines and maintains the diagnostic schedules and maintenance. The inspection schedule can be defined by the field devices and by the plant hierarchy. Or, PRM can assign multiple inspection schedules for a single field device.

3.6.3 Parts List

PRM manages device's spare parts information. The spare parts can be defined by a user, and PRM registers and displays the status of the stores spare parts. Search function enables to identify the instrumentation equipments which use the specified spare parts.

3.6.4 Link to Document

PRM manages and displays device-relevant documents in all the formats that Microsoft Windows handles. By registering the device instruction manuals or pictures how the devices are installed, all the necessary information is readily available for reference. When the Class View template is used, documents of the same device can be bundled together for registration.

3.6.5 Connecting with Maximo

PRM works in association with IBM's Maximo computerized maintenance management system (CMMS). CMMS uses quantitative data and performs device management while evaluating system conditions, and aims to improve efficiency in plant maintenance work. The equipment and device masters registered in PRM and the Maximo can be synchronized. Consequently, PRM's device master items can be used in Maximo, and equipment and devices information managed by PRM can be used as Maximo's information. In cases where PRM finds any failure in equipment or devices, a PRM Client issues a work order to CMMS. CMMS confirms the progress of requested operations so that an efficient maintenance workflow can be realized.

3.7 Security

PRM enables to set security by an individual user basis. A user has to log in to the PRM system by entering the user name and its password. The user operation is managed by the user group where the person belongs and by the user's authority.

■ User and User Group

In PRM, a user's authority is defined by the user and the user group. In order to log in to PRM, the user has to be registered in advance by the administrator. And the user belongs to a user group. The scope of operations is defined by the user group where the user belongs. By this user group function, PRM manages many user authorities effectively.

■ Device Security

Device security is a function to define device access restrictions by the user. Device security can be set to the hierarchy of the Navigator Window for each user group. For instance, in case the maintenance personnel are assigned to each of the factory equipment, the log in users are able to monitor only the equipments they are in charge of.

3.8 Initial Setting Procedures

PRM requires initial setting in accordance with the environment to use it. Required typical initial settings are given below.

■ Device Path

The plant configuration information is defined. The definition files output from CENTUM VP/CS 3000 System can be also used for setting.

■ Device Registration

PRM registers field devices. Intelligent devices are automatically registered by plug & play. Non-intelligent, analog devices can be registered manually when needed.

■ User Registration

Users are added and user authorities are changed.

■ Plant Hierarchy Configuration

The hierarchy of the Device Navigator is configured by right-click of the mouse or drag and drop.

■ Parameter Tuning

Parameters of the registered devices are stored and adjusted as required.

■ Maintenance Alarms

Maintenance alarms are defined using a filtering function. Operator notification and e-mail transmission can also be defined.

4. Functional Configuration of PRM Software

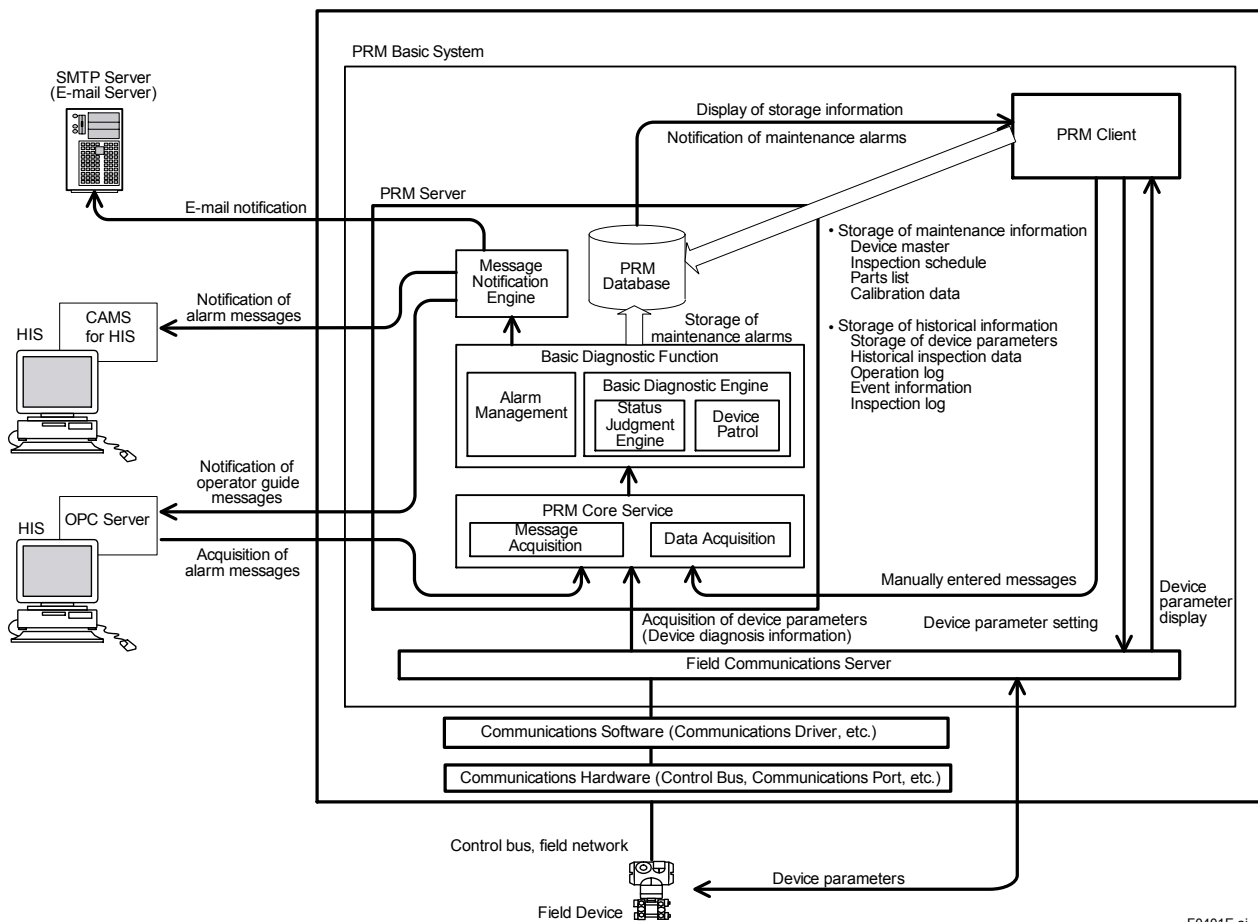
This chapter describes the basic configuration of PRM software.

4.1 Configuration of PRM Basic System Function

PRM basic system mainly consists of the following three components:

- Field Communications Server
Acquires field device information upon request from a PRM client or PRM server. The PRM client displays and the PRM server stores the acquired device information.
- PRM Server
Stores maintenance and historical information that the PRM client inputs and data and maintenance alarms that the field communications server acquires into its database.
- PRM Client
Serves as a human interface function for PRM. Maintenance and historical information are displayed or entered, and the field device parameters are set and displayed.

The figure below shows the functional configuration of the PRM's basic system.



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*1: No operator guide messages are sent when alarm messages are sent to CAMS for HIS.

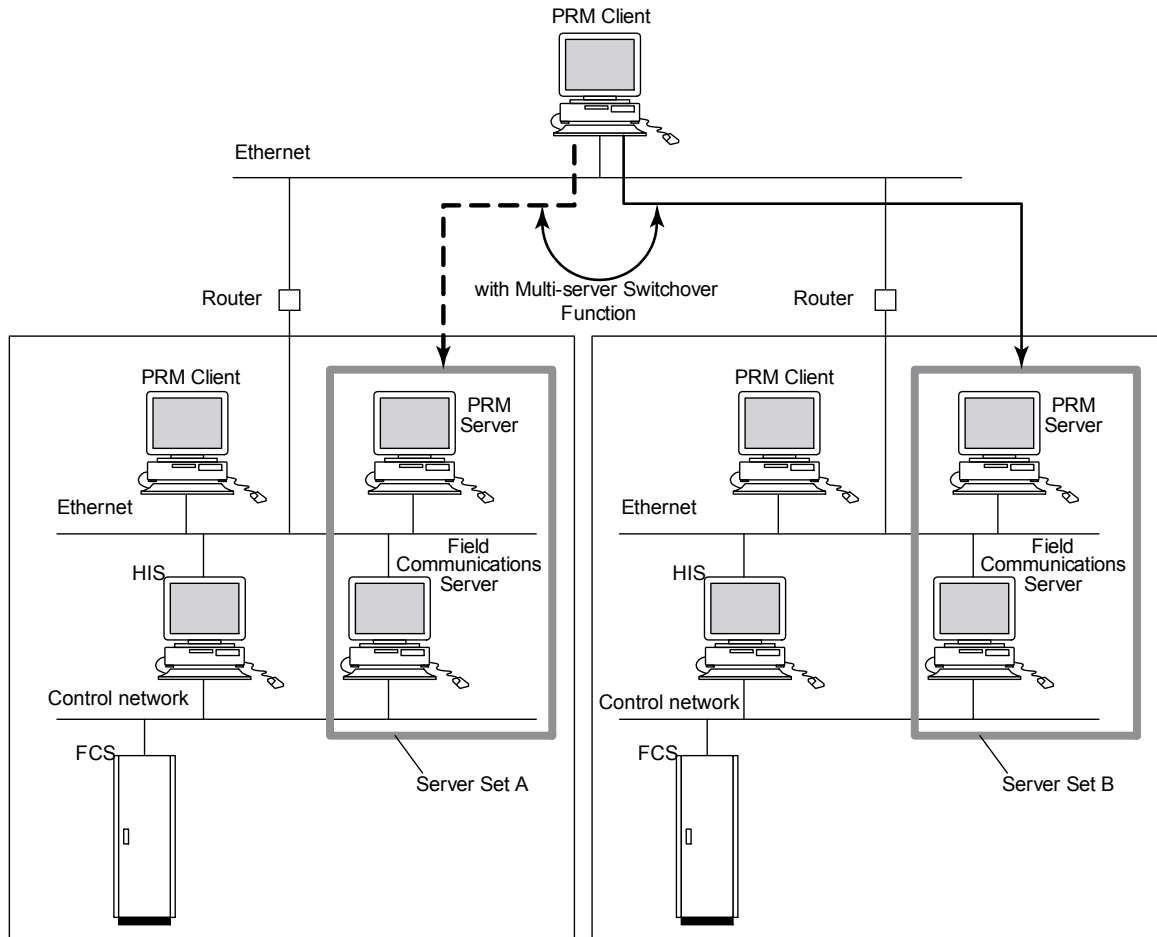
Figure Functional Configuration of PRM's Basis System

- **Conditions of PRM's Basic System Configuration**

The PRM basic system configuration allows a single PC to simultaneously reside three software tools that are field communications server, PRM client, and PRM server. In addition, for improving the system performance, the three software tools can also be installed on separate PCs. Multiple numbers of PRM clients can also be installed.

4.2 Multiple Server Configurations

A multiple server configuration can be constructed where a single PRM client is used to display and monitor the PRM systems shared among the multiple process plants as shown below. A multiple server configuration is preferable for distributing the operation loadings in case there are many field devices managed by a PRM system.



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Figure PRM Multiple Server Configuration

4.3 PLUG-IN Applications

PLUG-IN applications are optional packages for a PRM Client. Among those applications are a device vendor-supplied calibration tool, a self-diagnostic tool, and the like. PLUG-IN applications are launched by the PRM Client.

The functional configuration of the PLUG-IN application is as shown in the figure below.

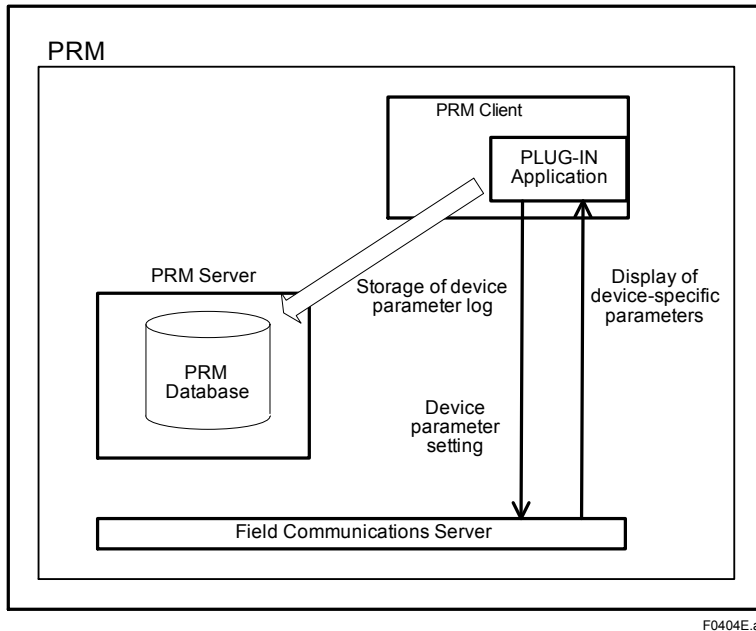


Figure Functional Configuration of the PLUG-IN Application

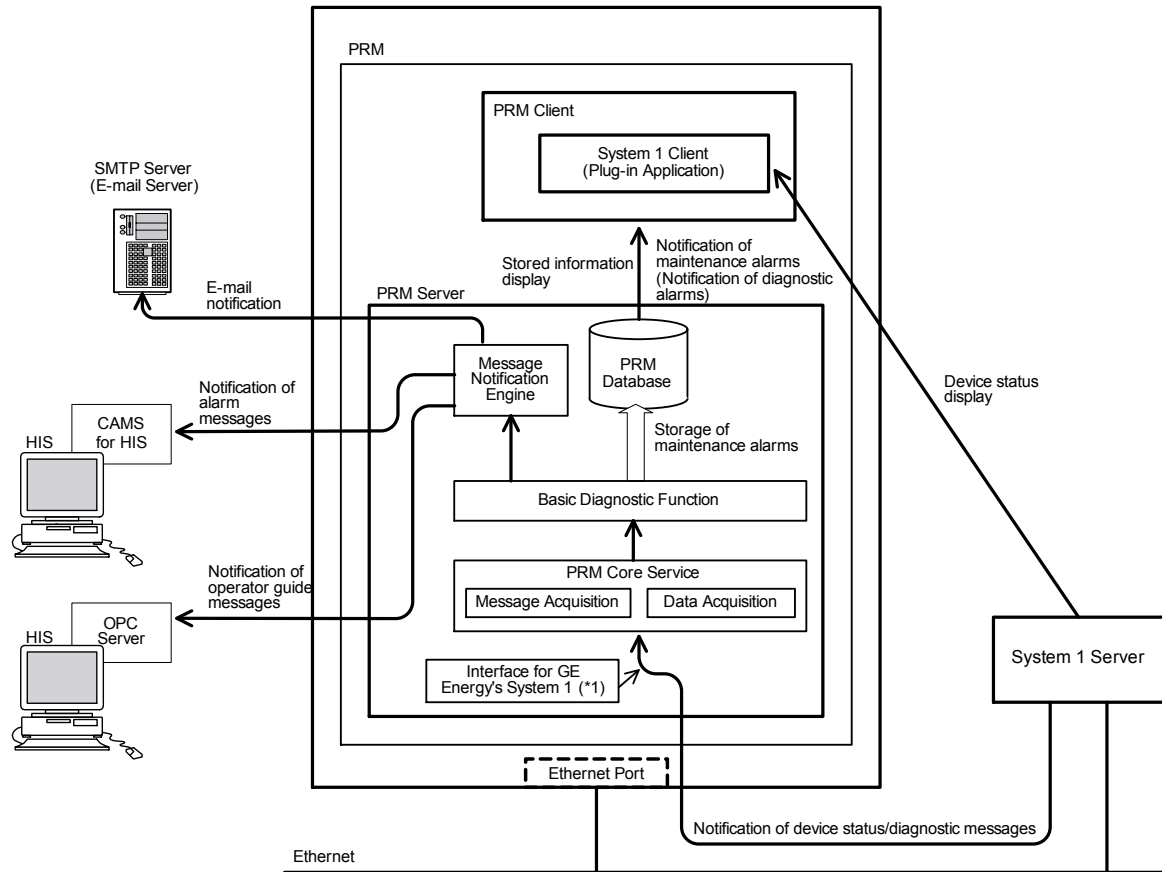
Each device vendor supplies PLUG-IN applications. Yokogawa's PLUG-IN application is as shown here:

- **PLUG-IN ValveNavi**

PLUG-IN ValveNavi is a tool to facilitate setting, adjustment and operation of Yokogawa's Advanced Valve Positioner (Model YVP110).

4.5 Interfacing with GE Energy's System 1®

The interface for GE Energy System 1 package enables PRM to connect with System 1, optimization and diagnostic platform). The figure below describes the interface for GE Energy's System 1 software configuration.



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*1: The interface for GE Energy System1 enables PRM to obtain and display System 1's data and messages.

Figure Interface for GE Energy System 1

■ Configurational Requirements for the Interface for GE Energy's System 1

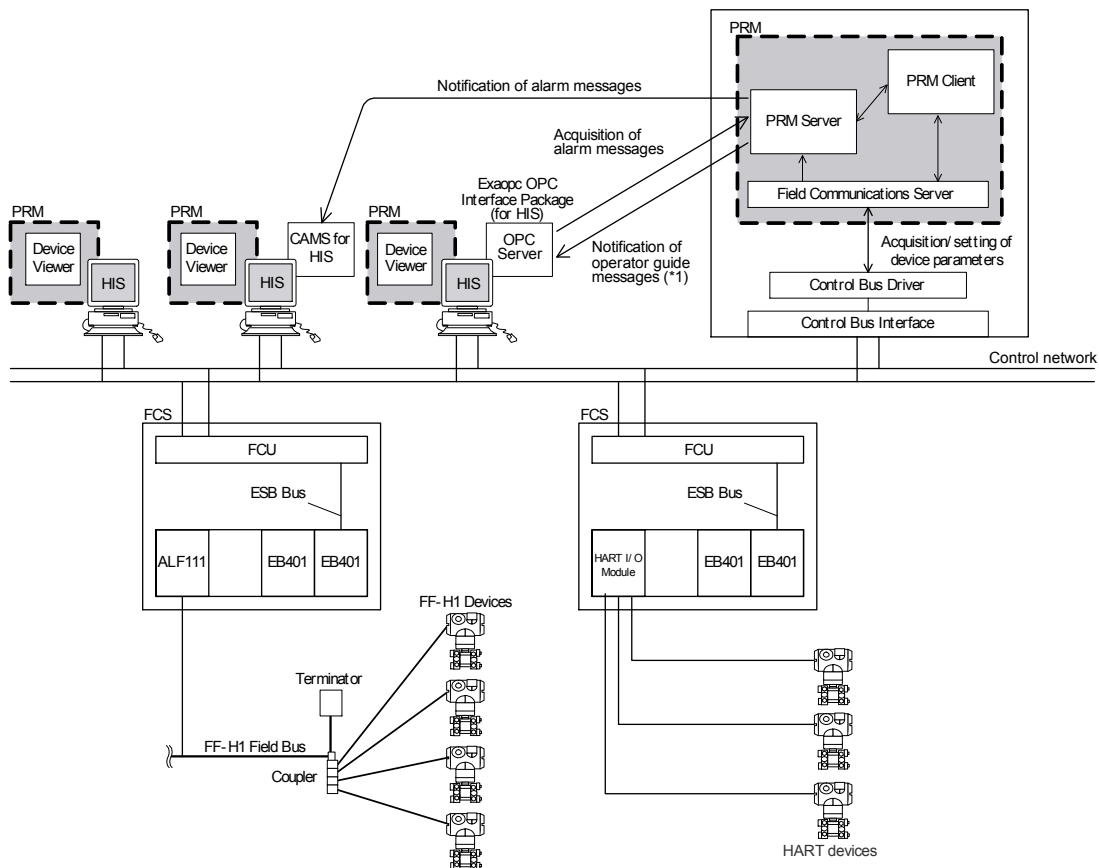
The Interface for GE Energy's System 1 must be installed in the same PC where the PRM Server package resides. When PRM is connected to System 1 using the interface for GE Energy's System 1, the System 1's client can be launched as a PLUG-IN application by a PRM client. Contact GE Energy for details on the System 1.

5. PRM System Configuration

PRM manages devices by being connected with various control systems. This chapter describes the PRM's system configuration for each system based on the case when the PRM's basic functions are installed in a PC.

5.1 Connecting with CENTUM VP/CS 3000

The figure below shows the system configuration when the PRM is connected with the CENTUM VP/CS 3000 system.



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*1: No operator guide message is sent when CAMS for HIS is enabled.

Figure PRM's System Configuration with CENTUM VP/CS 3000

PRM acquires and sets device parameters via a control network interface card, a control network, and a field control station (FCS). Alarm messages are acquired through the Exaopc OPC interface package (for HIS). For message notification, select either by consolidated alarm management software (CAMS for HIS) or the operator guide message via Exaopc OPC interface package (for HIS).

HIS: Human Interface Station

TIP

For alarm message acquisition, the Exaopc OPC interface package is also applicable; however, only the Exaopc OPC interface package (for HIS) is applicable to send operator guide messages. OPC servers for alarm message acquisition and for operator guide message notifications can be assigned separately. On the HIS, DeviceViewer is used for confirming the details of the operator guide messages from PRM. In that case, the DeviceViewer for HIS cannot be installed to the HIS where the PRM client resides. When the PRM client resides with HIS, DeviceViewer for PRM client is used.

■ PRM Basic System Configuration when connected with CENTUM VP/CS 3000

When connecting PRM with CENTUM VP/CS 3000 system, a PC where a field communications server is installed has to be connected to a control network. Exaopc OPC interface package (for HIS) is required for CENTUM VP/CS 3000 HIS.

TIP

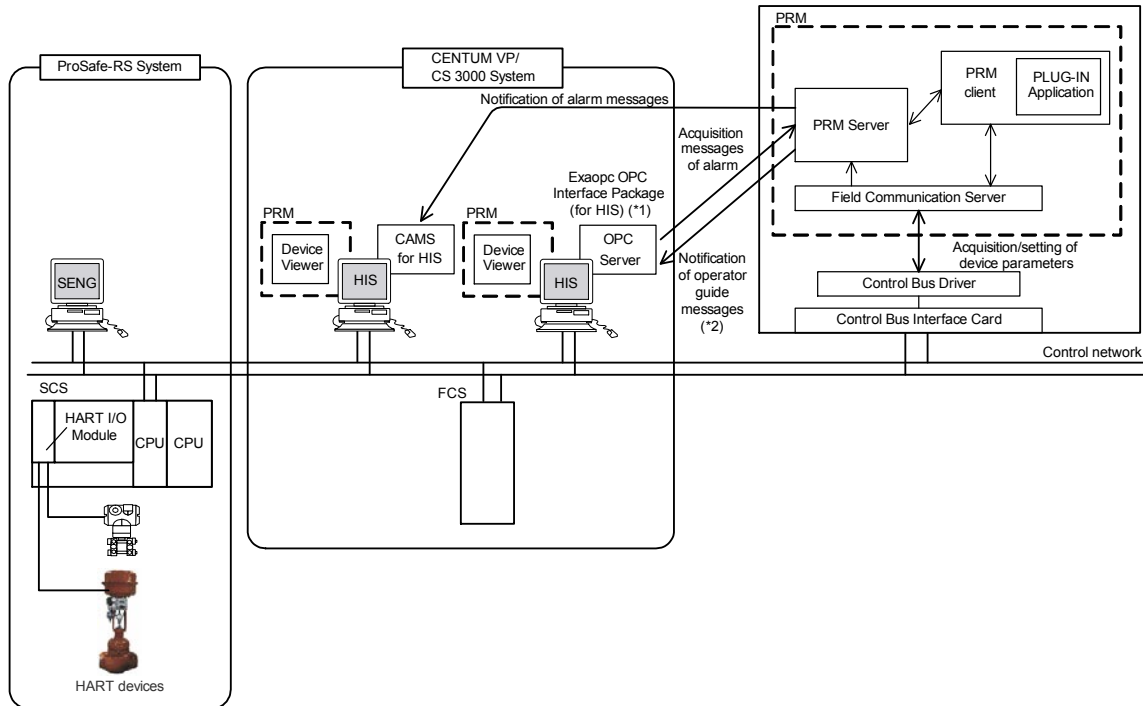
Multiple CENTUM VP/CS 3000 systems cannot be connected to a PRM server set. Multiple server set configuration is required when collective monitoring of multiple CENTUM VP/CS 3000 systems is required.

■ Coexistence of PRM Software Packages with CENTUM VP/CS 3000

The PRM client can reside with the CENTUM VP/CS 3000's HIS, but not the PRM server or the field communications server.

5.2 Connecting with ProSafe-RS System

The figure below shows the system configuration when the PRM is connected with a ProSafe-RS system.



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*1: In case when a PRM system is connected to a ProSafe-RS and CENTUM VP/CS 3000 systems, alarm messages of these systems are acquired through an OPC server running on the CENTUM VP/CS 3000 HIS.

*2: When alarm messages are sent to the consolidated alarm management software (CAMS for HIS), operator guide messages are not generated.

Figure System Configuration when PRM is connected with ProSafe-RS System

In this configuration, PRM acquires and sets device parameters via a control network interface card, a control network, a field control station (FCS), and safety control station (SCS). Alarm messages are acquired through the Exaopc OPC interface package (for HIS). For message notification, select either by consolidated alarm management software (CAMS for HIS) or the operator guide message via Exaopc OPC interface package (for HIS).

■ PRM Basic System Configuration When Connected to the ProSafe-RS System

When connecting PRM with ProSafe-RS and CENTUM VP/CS 3000 system, a PC where a field communications server is installed has to be connected to a control network. Exaopc OPC interface package (for HIS) is required for CENTUM VP/CS 3000 HIS.

■ Coexistence of PRM Software Packages with ProSafe-RS

The PRM client can reside with the ProSafe-RS's safety engineering PC (SENG), but not the PRM server or the field communications server.

5.4 Connecting with HART Multiplexer

The figure below shows the system configuration when the PRM is connected with a HART Multiplexer.

■ PRM Basic System Configuration When Connected with HART Multiplexer

When connecting PRM with a HART multiplexer, a COM Port of a PC where a field communication server is installed has to be connected to the HART multiplexer via an RS-232C/RS-485 medium converter.

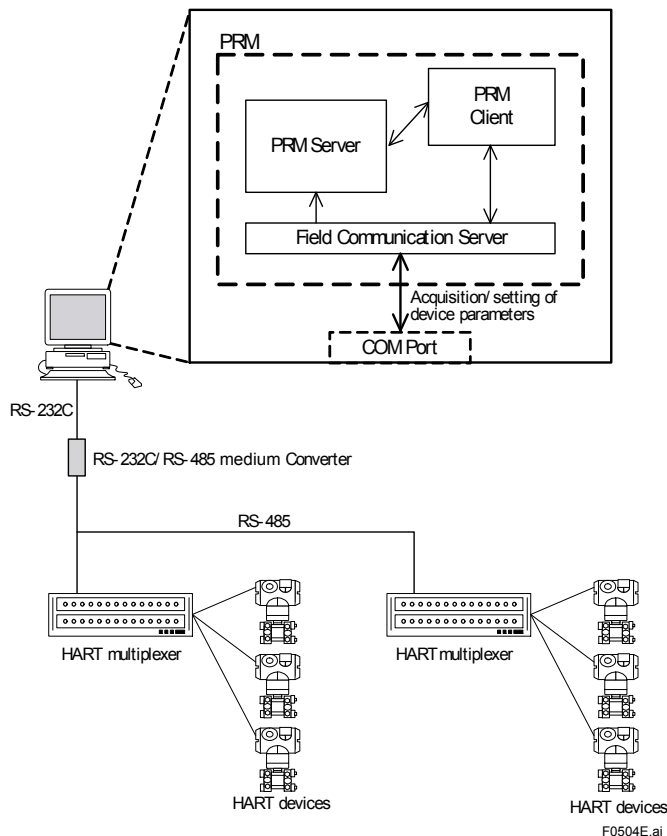
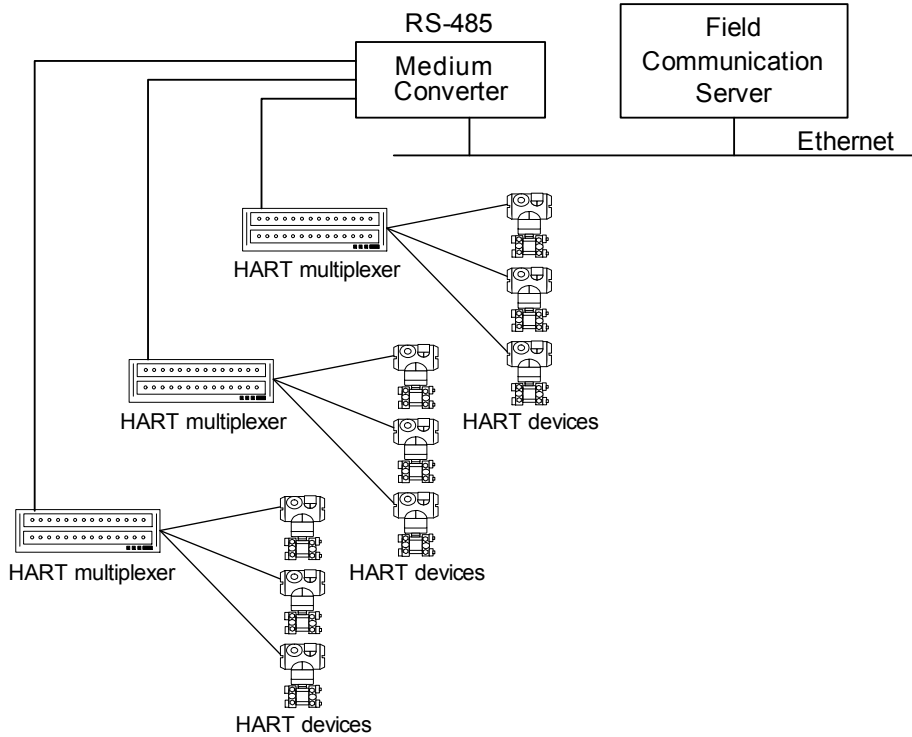


Figure System Configuration when PRM is connected with HART Multiplexer

Either or both a PRM client and a PRM server can reside in the same PC with a field communications server or independently on a different PC.

■ HART Multiplexer with Ethernet/RS-485 Converter

The PRM system sets and acquires parameters of HART devices through HART multiplexers via a COM Port or RS-232C/RS-485 medium converter. For communication load distribution, the PRM system can be connected to a HART multiplexer via multiple COM Ports or via Ethernet/RS-485 medium converter.



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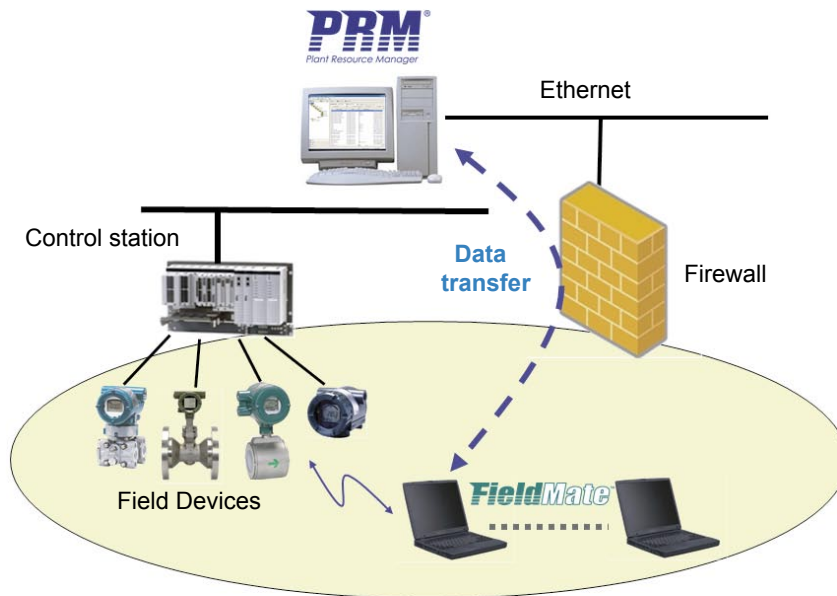
Figure System Configuration when PRM is connected with Ethernet/RS-485 medium converter

SEE Also

When an Ethernet/RS-485 medium converter is used, a HART multiplexer has to be connected virtually using the medium converter RS-485 port on the Ethernet as a PC's COM port. For details on how to install the converter, see an instruction manual of the applicable Ethernet/RS-485 medium converter.

5.5 Connecting with FieldMate

The system configuration below shows in a combination of the PRM and the FieldMate, connected on the Ethernet. The operation of this function is initiated by the FieldMate PC.



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Figure Connecting PRM with FieldMate

■ PRM User Account Setting

Setting a user account is required on the PRM:

- A PRM user account creation
- PRM user account authorization to enable accessing [PRM Synchronization: Update]

■ Establishing a connection with PRM network

It is required to establish a connection in between the PC with FieldMate and the PC with a PRM server or a PRM client so that the communications with the PRM database is enabled.



CAUTION

Before connecting to the PRM network, ensure the PC with FieldMate is sufficiently protected against security threats. (Make sure that the latest security patch and antivirus software are installed.) PRM and FieldMate must be connected to a network with established network security such as a firewall. These measures can prevent network computers from being exposed to computer virus attacks.

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