Inform^{IT} Power System Monitoring

PSM 500, PSM 501

Central Server, Station Server

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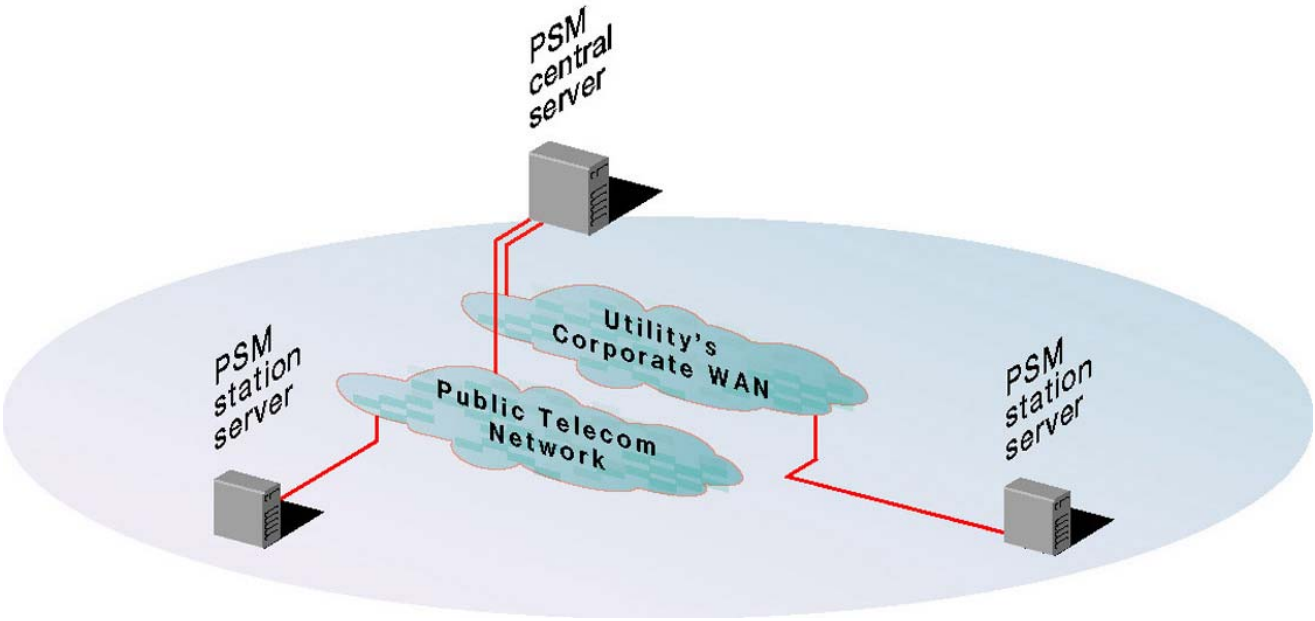
Technical Data



Introduction

Without attempting to generalize, it could be mentioned that in a large number of utilities and substations protection-related data and disturbance data has to be collected manually from the individual devices. This often means that the protection engineer has to travel to the substation to collect logged data from the individual devices suspected to have a malfunction. Subsequently the engineer uploads this data to the portable PC. Aside from this, the mentioned exercise requires a considerable amount of time to simply collect the data, and a lot of valuable data could be lost or overwritten in the device when an avalanche of faults occurs.

The approach of the Power System Monitoring and Information System (PSM) provides the utility with a useful decision-supporting system. The system allows automatic or manual acquisition of data from any substation configured in the PSM system.

User benefits

With the short, precise and selective information supplied by the PSM system, the outage time due to faults can be drastically reduced. Thereby reliability and security of the power transmission is assured.

Excellent decision support is provided because the user is able to access all relevant information at any place, any time, anywhere from a central server.

Thanks to the statistical information gathered from the archived data, the weakness of the system can be ascertained and corrected.

PSM relieves the operator by generating automatically short fault reports in case of a line fault. These reports may be printed, depending on different configurable conditions. Only relevant reports are generated and irrelevant ones are suppressed. This prevents unhelpful information flooding the operator after a line has tripped.

PSM is a scalable solution, which allows a step-by-step implementation and integration into the existing power network. This allows a very flexible system investment, which can also be matched to the existence of installed numerical devices and fault recorders as well as communication aspects to particular stations.

Application

The PSM application is used as an automated centralized concentrator for disturbance record data. Disturbance records are automatically collected from all connected stations and stored in a central database. This functionality is useful whenever different stations equipped with numerical devices or fault recorders have to be monitored in a consistent way. PSM can be applied in:

- monitoring of transmission lines at the distribution, transmission and sub-transmission voltage level
- automated disturbance record archives for power grids at any voltage level and for distributed power plant applications
- alarming, triggered by automated disturbance record evaluation for distributed power plants.

Furthermore algorithms and services can be automatically applied, whenever new disturbance records are uploaded into the central server. This enables the following additional applications:

- Automated fault location
- Outage management installations, whereby PSM automatically notifies all registered maintenance people, partner utilities or end-customers, whenever a fault localization matches configurable criteria.

Typically a PSM installation is extended, when:

- the secondary equipment of an existing station is refurbished
- new stations are built and integrated in the power grid
- disturbance recorders are installed in a station
- agreements with neighboring utilities contain data exchange for dedicated, important primary installations like lines or transformers.

System design

Two aspects of the system design are described here:

- Server-client architecture
- Data flow
- Installations in stations.

Server-client architecture

The heart of a PSM installation is a central server. This server may be located in the central office.

All disturbance records and data uploaded from the stations are referenced and stored in its central database. Different workplaces (clients) having sufficient access rights to the central server can use the data and additional results calculated automatically and supplementary services, which may run on this server.

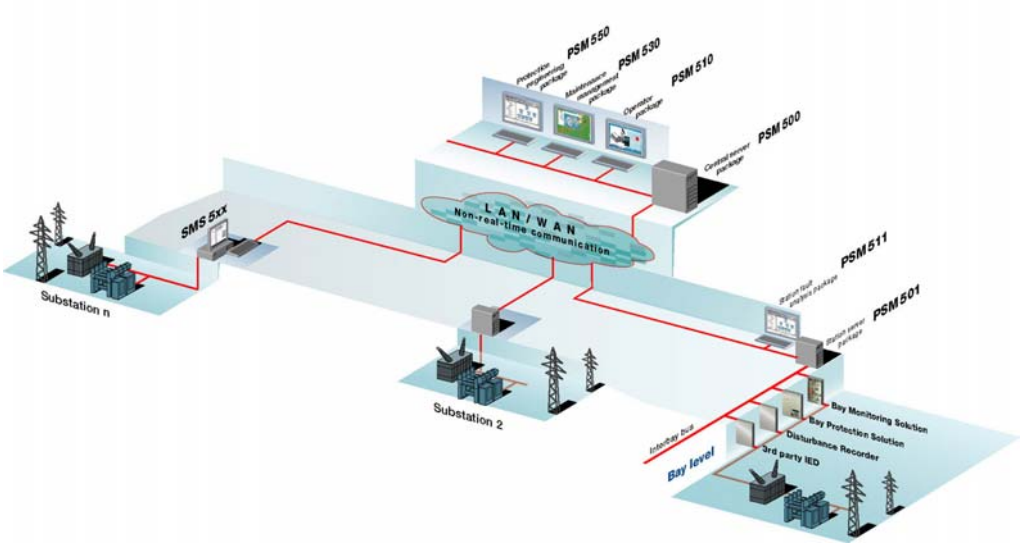


Fig. 1 Server-client architecture of PSM

In general the data flow runs always from the stations up to the central server. Users located at the workplaces are requesting data from the server via the corporate local area network.

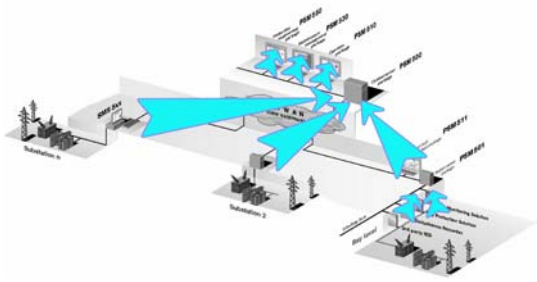


Fig. 2 Data flow in a PSM system

Installations in stations

There are many possibilities to integrate stations in a PSM system.

- In the station there is a "Station Automation System" or a "Station Monitoring System" operating, like the SMS530 from ABB, which uploads disturbance records into a local directory automatically.
- The station is equipped with a PSM station installation.
- In the station there is a PC with an automatic upload software for dedicated disturbance recorders.
- In very small stations the "SPA station bus" developed by ABB can be directly connected to the central server PSM 500 via a dial-up modem. This is also possible for Indactic 650 disturbance recorders as well as relays connected to a SEL2030 communication gateway. The advantage of this communication design is that a PC installation in the station is not required, but the disadvantages of this solution should be considered, see Chapter "The module E_com", on page 10.

Communication media

The workplaces communicate with the server via Ethernet using the TCP/IP protocol. The PSM central server communicates with the station servers via a TCP/IP connection or dial-up modems. Depending on the communication and security policy of the utility and also on the installed communication network, PSM is configured to use the internal network or a public network or a combination of both.

Server packages

The software modules are packaged differently for each PSM installation. Therefore the central server, the station servers and all workplaces may have a specialized combination of software modules. After the installation the software modules and options are enabled with software keys described in the Chapter “License handling”.

The packages for the workplaces are described in an additional Data Sheet [1], which is referenced at the end of this document, in the Chapter "Other relevant documents".

PSM 500 Central server package

This package is the heart of a PSM installation. It provides automated data acquisition from substations, references all disturbance records in the SQL database and applies automated fault location. A graphic view of the PSM communication network and a graphic tree containing all the recording devices simplifies the PSM configuration and enables easy navigation to all settings.

Server applications such as automated printing of short fault reports or the integrated Internet information server, a user notification service, or a geographic information server, or a high-performance database can be ordered as options.

PSM 501 Station server package

This package is responsible for automated data acquisition from the devices and is typically installed on a PC, which is close to the bay level devices such as disturbance recorders or protection relays.

As an option the spontaneous data transfer module, which initiates a transfer from the station level, is available. A further option is automated fault location.

Software module and feature overview

The PSM software consists of different functional modules. These modules are combined in different ways to build a PSM server application, a PSM station installation or PSM workplaces.

Fig. 3 shows the graphical representation of the modules. Every PSM installation has access to a database module, which works as a data storage. The modules in the outer pie slice are dependent on a module in an inner pie slice. E.g. the module E_notify requires an “E_wineve server” installation with automatic fault location.

Enterprise applications

Customized applications combine information gained by PSM with data provided by other software systems or applications.

For example, a software interface to an Enterprise Resource Planning application (ERP) enables PSM to merge the duty roster of the maintenance staff with the PSM notification service, and therefore only the available personnel is alarmed in case of a line fault.

Another possible application uses information imported from an asset management application. Additional fault information, e.g. drawings of poles close to the fault, could be displayed on the workplace of a maintenance engineer. Or the list of recommended tools and spare parts, which may be necessary for repair of the line is appended to the e-mail, which is forwarded by the PSM notification service.

Furthermore the statistical analysis module of PSM could be extended reusing data from a public lightning database. The location of the lightning could be correlated with the exact fault locations calculated by PSM. The result gained by this correlation implies limited investments in surge arresters or other selective steps to improve power reliability.

New views generated by all these applications can be integrated and displayed on specified PSM workplaces.

Ask our sales staff. In close cooperation with you, they will work out specifications, which represent your needs and generate long-term profitability.

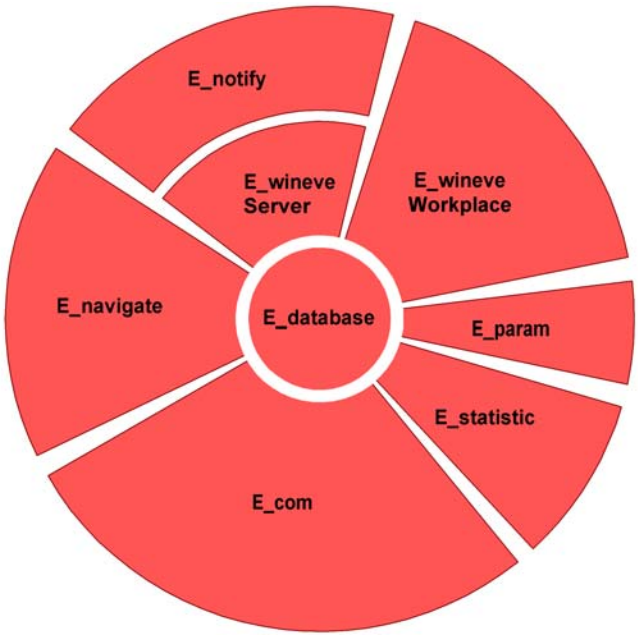


Fig. 3 Modules of the PSM software suite

Software module and feature overview (cont´d)

Table 1: Modules applied in different installations (Typical diagram)
"X" means, that the package contains the software module. "O" means the package contains the software module as an option.

Software modules / Software installation	E_database	E_com	E_navigate	E_wineve Server	E_wineve Workplace	E_notify	E_statistic	Remarks
PSM 500 Central server	X	X	X	X		O		
PSM 501 Station server	X	X	X	O				Option “E_wineve Server” used for automatic filtering, printing or file conversion
PSM 510 Operator workplace with access to the central server					X			E_wineve workplace, variant “Relview” Described in [1]
PSM 530 Maintenance management workplace with access to the central server					X		O	E_wineve workplace, variant “Professional” Described in [1]
PSM 550 Protection engineering workplace with access to the central server					X		X	E_wineve workplace, variant “Expert” Described in [1]
PSM 511 Station fault analysis workplace with access to the station server					X			PSM 511 has only access to local disturbance records of the local station server PSM 501
PSM 505 Stand-alone fault analysis and evaluation package (explained in [1])	X		X		X			

Some of the modules themselves exist in different versions. Enterprise or expert versions allow full functionality with highest performance. The versions and features of the different software modules are described in detail below.

Table 2: Key features of PSM servers

Module	Features	PSM 500	PSM 501
E_database	Microsoft SQL database	X	X
	Integrated backup and recovery service	X	X
	Cleanup service for old backups	X	X
	High database performance option	**O**	
E_navigate	Easy navigation to view PSM configuration	X	X
	Configuration of all communication parameters and power network parameters	X	X
	Different windows authority levels for navigation and configuration	X	X
E_com	Upload files from remote substations	X	X
	Upload files from other directories on Windows PCs	X	X
	Upload disturbance records from protection devices		X
	Upload disturbance records from disturbance recorder systems	X	X
	Spontaneous data transfer to central server		X
E_wineve server	"One-Terminal Fault Location" (OTFL) algorithm is automatically applied	X	O
	"Two-Terminal Fault Location" (TTFL) algorithm is automatically applied	X	O
	Automatic printout of the "short fault report"	X	O
	Convert and store disturbance record file automatically into COMTRADE format	X	O
	Expert evaluations enable file filtering	Expert	Expert
	Copy files which pass the filter to a freely configurable directory	Expert	Expert
E_notify	Notification via FAX	O	
	Transmission of short text message to mobiles	O	
	Sending e-mails to all registered recipients	O	

The module E_database

This module is the data store of a PSM system. It provides the following main features described in detail below:

- SQL database based on "SQL Server" from Microsoft
- Integrated backup and recovery service
- Clean-up service for old backups
- High-performance option available.

PSM uses a relational database to store all the configured static information about the topology of the power grid and the secondary devices. In addition the disturbance records are referenced and the fault calculation results stored. The database is a requirement to apply new fault location algorithms, which consider the topology of the power grid. One example is the so-called two-terminal fault location algorithm, see Chapter "The module E_wineve" below, or [1] Chapter "Other relevant documents". This algorithm uses disturbances recorded in both substations connected to a faulty line. Combining the information of both disturbance records, the fault location is calculated with an improved accuracy. Using the information in the database, the central server applies the "two-terminal fault location algorithm" automatically.

Because all the information is accessible by a standard SQL interface, ABB can develop new views on the stored and well-structured information. Customized statistics can be easily developed on the customer's request. It is possible for example to build gateways to other applications, e.g. "Maintenance Management Systems", which are reusing the information gathered by PSM.

An important feature of E_database is an integrated "backup and restoring service". This minimizes data loss in case of a hard disk crash by copying data to an external data storage, such as a tape or network disk. This service runs as a background process in freely configurable time intervals.

An additional feature saves disk space on the backup drive. It cleans up the backup drive. This service scans the backup drive and removes database backups, which are older than a configurable number of weeks.

E_database is based on the database managing system "SQL-Server" from Microsoft. For bigger PSM systems a high-performance option, named E_database expert is available.

Table 3: Options for E_database

Module name	Recommended for	Limitations
E_database Standard	• PSM station server • E_wineve stand-alone applications	• Two external workplaces may connect simultaneously to the database • The database size is limited to 2 Gigabytes, which is sufficient for small PSM systems
E_database Expert	• PSM central server	• No limitations

The module E_navigate

This module is used to configure PSM with static information about the power grid, which is represented by substation lines and feeders. Also the secondary devices and the mapping of measured signals and power lines are configured with this module. It provides the following key features:

- Easy navigation because of tree structure with expandable nodes
- Stations can be combined to regions
- Devices are grouped into stations
- Aside from the tree structure, graphical view-panes exist in addition
- A freely configurable background can be added to every view-pane
- Pull-down menus for any tree node and icon

- Freely configurable comments appearing when the mouse pointer crosses an icon
- User authentication based on the Windows user group concept
- Different authentication levels for viewing or changing the configuration.

The graphical view of the communication network and a tree-structured view of all recording devices simplify navigation. Devices are grouped in stations. For big installations it might be helpful to group stations in regions.

The tree structure is also displayed on graphical view panes. An overview with all substations is displayed on one view pane. For every region and substation there is a separate view pane, where the devices and substation icons can be arranged in any way desired. In addition a picture in bitmap-format can be added to every view pane as a background. In this way additional information can be provided for the users.

Pull-down menus containing all relevant commands are available for every node in the tree node and also for every icon in the graphical view pane just by a right mouse click.

The authentication is based on a strong user management of the Windows operating system. This allows high security for unwanted access to PSM data.

This module is installed on the PSM central server and also on all PSM station servers. It is especially needed for stand-alone disturbance record evaluation installations without network connection to a PSM server.

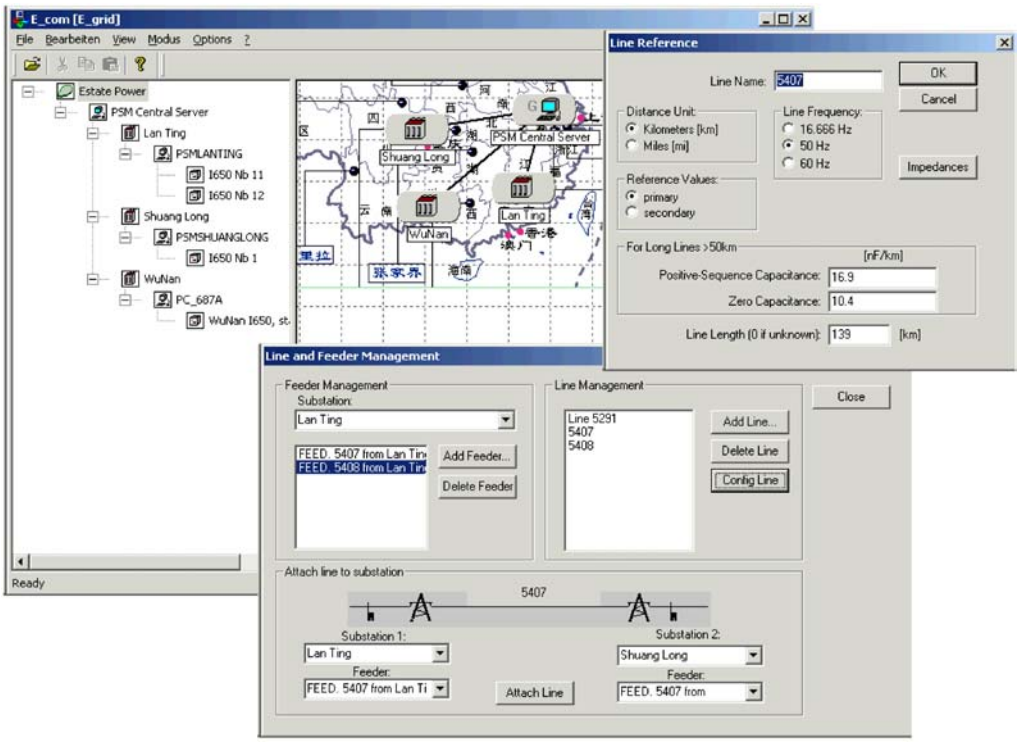


Fig. 4 Screen shot of the module E_navigate used to configure a PSM system

The module E_com

E_com is the communication module of PSM and enables automatic but also interactive remote data collection. This module is installed and enabled on the PSM central server and all PSM station servers. The functional differences of these two installations are explained and also communication issues are shown.

E_com installed on a PSM 500 central server

The automatic data acquisition typically takes place in two steps first on the station and subsequently on the network level. The station collects the data on the station level continuously. The central server on the network level polls the station servers in configurable time intervals to upload all collected data and also to supervise the communication quality to the station servers. The user may stop the described automatic acquisition and upload disturbance records manually, whereby he is supported by graphical navigation and enhanced Windows file dialogs.

On the network level PSM supports data collection from the following PC-based remote installations.

- PSM station servers
- Substation Monitoring Systems, which upload disturbance records from devices automatically, like SMS530 from ABB or from third a party
- Substation Control Systems, which upload disturbance records from devices automatically, like SAS5xx from ABB or from a third party
- Disturbance recording systems like Indactic 650 from ABB or from a third party.

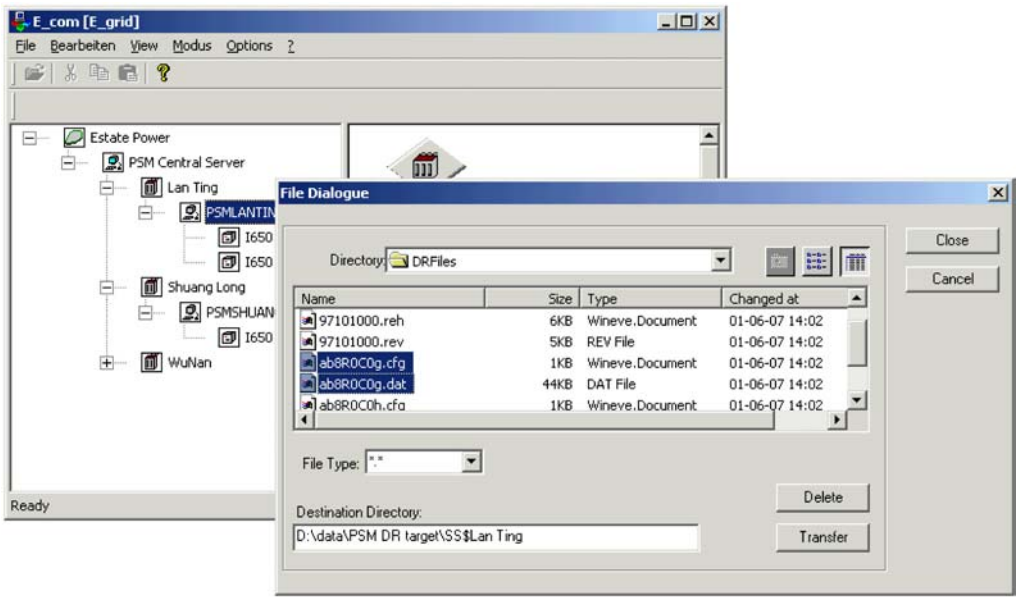


Fig. 5 Interactive disturbance record upload from remote places with PSM

Devices directly connected to the PSM 500 central server via modem

In very small stations the "SPA station bus" developed by ABB can be directly connected via a dial-up modem to the central server PSM 500. This is also possible for Indactic 650 disturbance recorders as well as relays connected to a SEL2030 communication gateway. The advantage of this communication design is that a PC installation in the station is not required, but the following disadvantages must be considered:

- Data loss, because protection devices and also some disturbance recorders have limited storage capacity. A new unimportant record may overwrite an older more important record
- Delay in information, because the option "spontaneous data transfer" is not implemented in the station. "New" data at the central server might be some hours old
- Possible weak modem error handling at remote site. Modem error handling is an important task delegated to the intelligent device, which is connected to the data port of the modem. E.g. modern PC-based operating systems support this error handling
- Availability of spare modems. The number of suppliers, who are able to deliver reliable low-bandwidth modems for a SPA bus environment, is decreasing.

E_com installed on a PSM 501 station server

A PSM installation in a station contains at minimum a PSM station server. Devices can be connected to the PSM station server directly or via a protocol-specific star coupler or a COM-Port channel selector. The station server collects all disturbance records from the connected devices and makes them available for the central server on the network level as well as for a connected optional "PSM station workplace".

Spontaneous data transfer option

This option substantially increases the availability of information.

The station server notifies the central server immediately as soon as an event file has been uploaded from a protection device, from an Indactic fault recorder or from other PC-based monitoring software. For modem connections, this means that the substation PC initiates a call to the central PSM server, which subsequently uploads all new disturbance records.

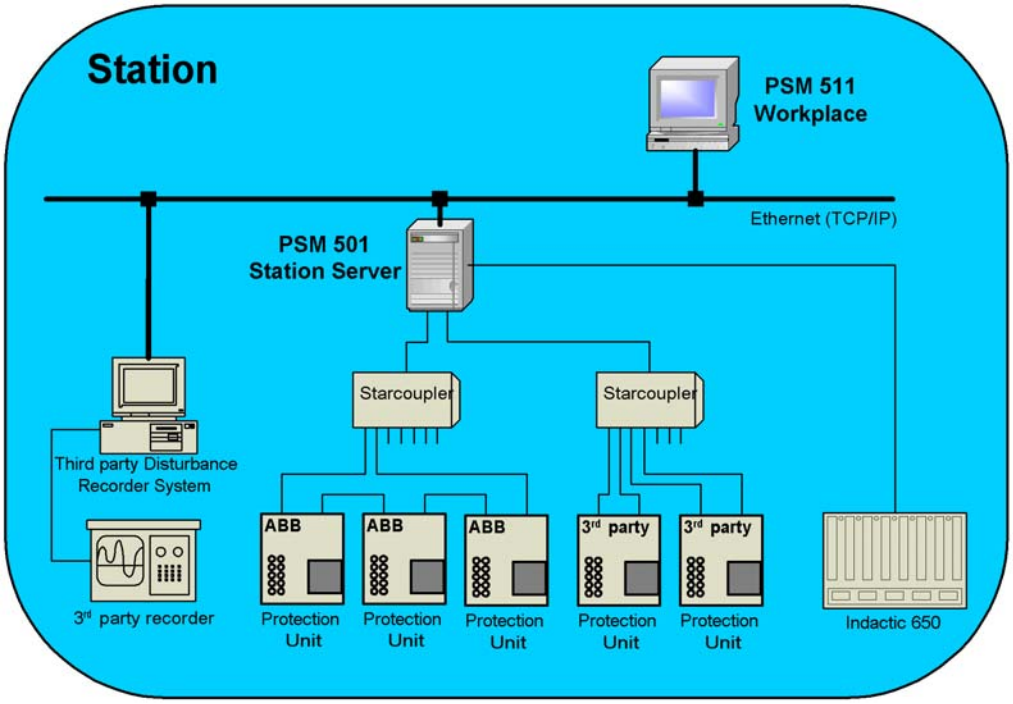


Fig. 6 Typical PSM installation in a station

The module E_com (cont´d)

Table 4: Protection units able to be connected to a PSM station server

Device	Manufacture	Communication protocol
RE.216	ABB	SPA
RE.316*4	ABB	SPA
MDAR	ABB	INCOM
REL301 / 302	ABB	INCOM
REL350 / 352	ABB	INCOM
REL512	ABB	ASCII and XMODEM
GEC Optimho LFZP11x, 12x and 15x	Alstom	Alstom proprietary
SEL-321	Schweitzer	Serial RS232 or via SEL 2030

Further devices are added continuously. Ask your local distributor, if your device is not listed.

Table 5: Supported communication couplers

Device	Manufacture	Communication protocol
SEL-2030 Communication Gateway	Schweitzer	Serial RS232
SPA-ZC22	ABB	SPA

Further communication interfaces and couplers may also be of service. A qualification by ABB is possible on request.

Communication

The communication between the stations and the central server takes place via TCP/IP connections or dial-up modems.

The PSM system performance relies on the communication speed especially for modem connections. For an acceptable performance a communication speed higher than 19.2 kBit/s is recommended. This can also be achieved with digital power line carrier systems, e.g. ETL500 / AMX500 from ABB.

Security aspects in communication

PSM uses the secure encoding service from the Microsoft operating system. Windows 2000 offers 4 security levels for RAS and IP-based connections. For PSM the following encoding scheme can be used:

- **No encryption**: This option allows an unencrypted connection
- **Basic:** For dial-up and PPTP-based VPN connections, Microsoft Point-to-Point Encryption (MPPE) with a 40-bit key is used. For L2TP over IPSec-based VPN connections, 40-bit DES encryption is used
- **Strong**: For dial-up and PPTP-based VPN connections, MPPE with a 56-bit key is used. For L2TP over IPSec-based VPN connections, 56-bit DES encryption is used
- **Strongest**: For dial-up and PPTP-based VPN connections, MPPE with a 128-bit key is used. For L2TP over IPSec-based VPN connections, triple DES (3DES) encryption is used.

The default encoding scheme of PSM is "strong".

The module E_wineve server

Automatic actions, which are related to fault calculation or disturbance record file conversion, are bundled to the module "E_wineve Server". It runs typically on the PSM central server and optionally on a PSM station server.

If a running E_wineve server is stopped on the PSM server, full functionality of a PSM workplace equipped with the module "E_wineve workplace" is available.

The module "E_wineve Workplace" contains a viewer with many useful features to display disturbance records, different algorithms for fault location and strong interactive evaluation tools to analyze disturbance records. The detailed functions of E_wineve workplaces are described in a separate Data Sheet, [1].

Versions of E_wineve server

There are different versions available for the PSM servers and for the interactive workplaces. Functions, which are automated run on the server versions.

- E_wineve server Professional
- E_wineve server Expert.

Functions of the E_wineve server Professional

The following functions are included, which run all automatically as soon as a disturbance record has been uploaded.

- One-terminal fault location algorithm is automatically applied
- Two-terminal fault location algorithms are automatically applied
- Automatic printout of the "short fault report"
- Convert and store disturbance record file automatically into COMTRADE format
- Passing short fault report and bitmap on module E_notify.

Functions of the E_wineve server Expert

In addition to the functions of the E_wineve server Professional, the Expert version contains the following functions:

- Expert evaluations enable file filtering
- Copying files, which pass the filter to a freely configurable directory.

Short fault report

The information printed out in the "short report" (see Fig. 7) is the following:

- General information about the fault event
  - Name of the acquisition unit recording the disturbance
  - Number of the acquisition device
  - Date and time of the disturbance record
  - Information of the line name and line length
  - The complete directory path and name of the disturbance fault record
  - Duration of the fault record
- Information regarding the trigger, which causes the record
  - Type of trigger
- Information regarding the disturbance and location of the fault
  - Fault type
  - Fault duration
  - Impedance at the fault in polar and cartesian format
  - Distance to the fault.

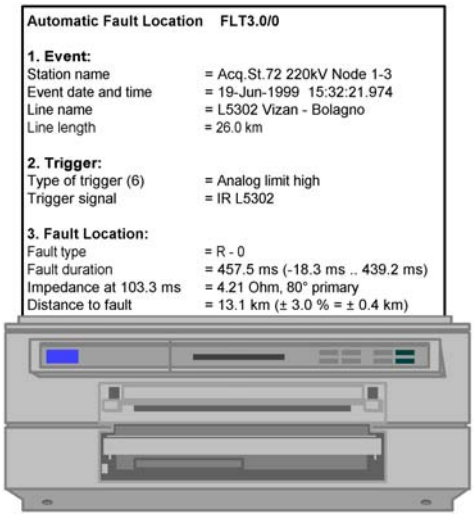


Fig. 7 “Short Fault Report”

The module E_wineve server (cont´d)

Automatic two-terminal fault location

This algorithm uses disturbance records recorded in different substations connected to both ends of a faulty line. Combining the information of both disturbance records, the fault location is calculated with an improved accuracy. It would be a simple way to implement a two-terminal algorithm, calculating the average value, using one-terminal location algorithm applied from both line ends. But the two-terminal fault location algorithm, which has been developed by the utility TVA (Tennessee Valley Authority) together with ABB, is much more advanced. It combines samples from both disturbance records initially and therefore minimizes line parameter uncertainties and inaccuracies during measurement.

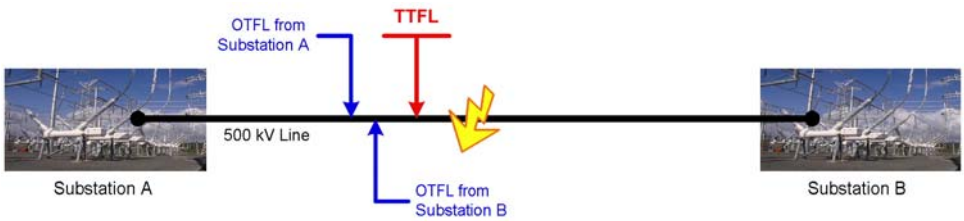


Fig. 8 Two-terminal fault location algorithm applied to disturbance records provided by a customer.
OTFL means One-Terminal Fault Location, TTFL means Two-Terminal Fault Location.
The yellow arrow symbolizes the real fault location.

Table 6: Example of calculated distances compared with real values, based on disturbance records provided by a customer

Line length	OTFL from A	OTFL from B	TTFL	Real distance
139.0 km	28.3 km	104 km	29.6 km from A 109.4 km from B	30.6 km from A 108.4 km from B

There is a new version 1.5 of PSM, where E_wineve applies this algorithm automatically, as soon as the disturbance records of both line ends have been up-loaded to the central server.

Before E_wineve applies the “two-terminal fault location algorithm” to two DR files, it checks the following three conditions:

- The fault is on the same line and phase, referenced in the disturbance records
- The fault type seen from both sides is equal
- The trigger time of both files differs less than by some seconds.

The two-terminal fault location algorithm has the following limitation in PSM V1.5:

- The fault recorder has to be configured with an identical sampling rate at both line ends.

The module E_notify

This function is very helpful for maintenance people or operating personnel, especially when they work in the field or are on call. This module supports the following three ways of user notification:

- Notification via Fax
- Transmission of short text messages to mobiles
- Sending e-mails to all registered recipients.

FAX notification

E_notify supports the transmission of faxes to different FAX devices. It is coupled to the E_wineve server application, which runs on the central server PSM500. The E_wineve server automatically applies fault location algorithms and hands over the results to the notification module E_notify. The Fax service of E_notify uses an interface of the widespread and well-proven, commercial software program “WinFax PRO”.

The content of the information, which is sent to Fax devices, can be configured for each device. The faxes may contain the following information:

- Short fault report
- Oscillographic curves (Bitmap file), created by the E_wineve server.

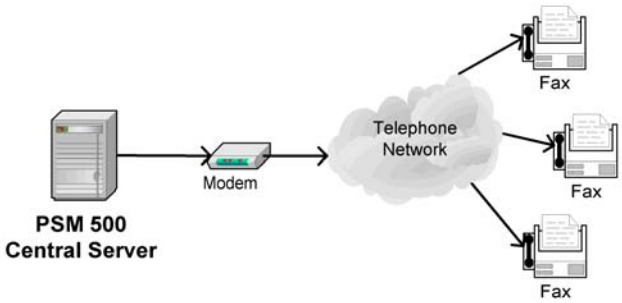


Fig. 9 Notification to Fax devices

Short message service notification

PSM supports a messaging service to mobiles. Recipients are configured in E_notify. If the service is enabled, they will receive a short message after the E_wineve server has applied the fault location algorithms automatically. The message contains the name of the faulty line and the fault location.

E_notify uses the messaging service of the company Simplewire, referenced in [2]. Simplewire is a wireless messaging provider. E_notify accesses this provider via a normal Internet connection. Customers, who want to use this service, need to have access to the Internet and have to open an account with the messaging provider Simplewire. Simplewire has contracts with the most common national telecom providers all over the world, which will forward the message to the mobile numbers passed by E_notify. The mentioned account is bound to the customer and is not dependent on the number of recipients. All national telecom providers supported by Simplewire are referenced in [5].

The module E_notify (cont´d)

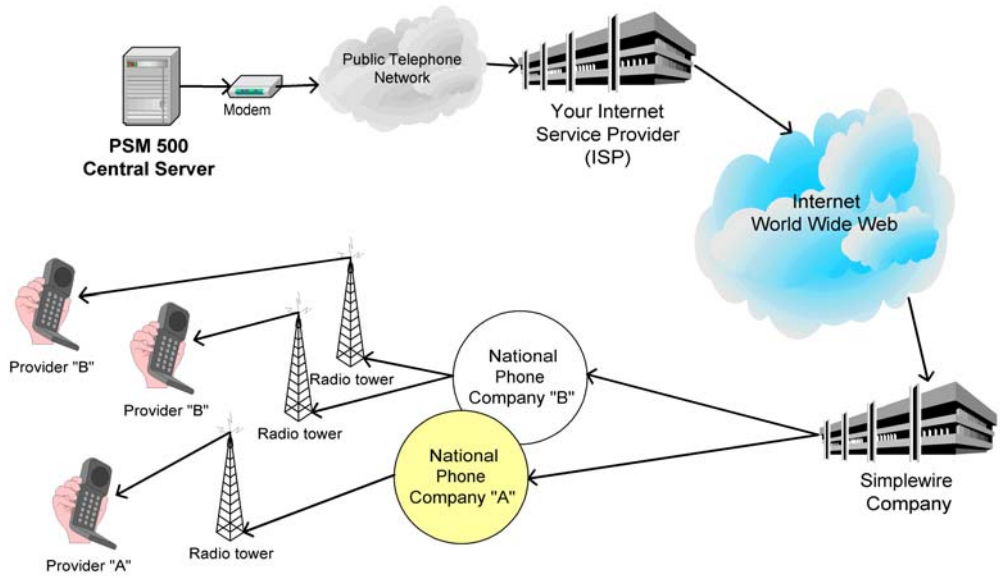


Fig. 10 Information flow from PSM 500 to mobiles. Instead of the modem an existing LAN – Internet gateway may be used.

E-mail notification

The same information as described in the section FAX notification above can also be sent as an attachment to all registered e-mail recipients. For this service E_notify requires a mail server with a POP3 interface for incoming mails and a SMTP interface for outgoing mails. These are standard requirements of a mail server, which are fulfilled by most Internet service providers, like Yahoo or GMX. The client can also use the internal mail server of his company if it provides a usual POP3 and a SMTP server interface.

The module E_param

E_param allows the use of device parameterization tools from remote places.

The module uses the on-line screen capturing functionality of a commercially available software. Therefore the device tools are running locally in the station server and the screen is captured and transmitted using the Microsoft Windows communication with a remote working place.

The advantage of this solution is that in case of a communication interruption the critical data transfer between the device and "device setting software" is not affected.

License handling

Functions of PSM are license-protected. Every installation of PSM needs a software key, which is bound to the PC hardware.

In order to get the needed license key, install all modules of PSM you are interested in. Start the E_wineve or E_com module and fill in the license request form. You find the form under menu "options", click "License...". After pressing OK your license request file will be generated. Send the file named "PSMLicense.req" via e-mail to SA-LEC-Support@ch.abb.com and you'll get the software key enabling the ordered functions. Alternatively you can send us the requested file on a diskette. In case the e-mail and mail service does not work you can send the requested file via fax using a simple text editor such as Notepad for opening and printing.

Please mention the order or project number in the e-mail or on the fax.

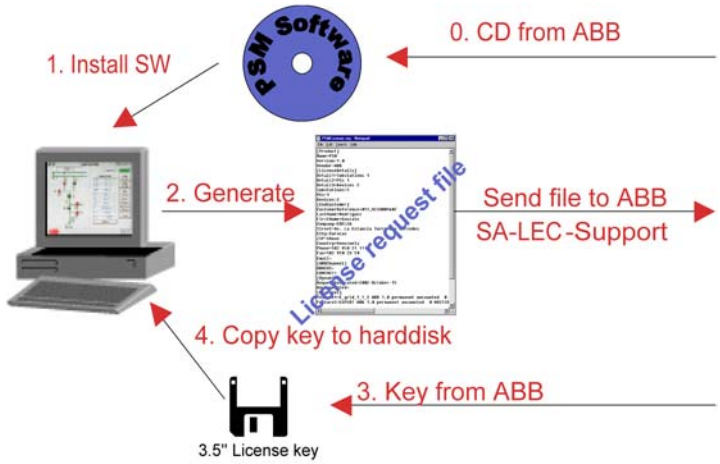


Fig. 11 The method of getting the license key required to enable modules and functions of PSM

Technical requirements

PSM runs on the listed Windows® operating system and has the following requirements on the PC-hardware.

Table 7: PSM 500 central server

Minimum requirements on the hardware used	• Intel Pentium – 2 GHz CPU or equivalent • 512 MBytes RAM • 40 GBytes hard disk storage for SW and operating system storage. Capacity for disturbance records is not considered hereby • CD-ROM drive • Keyboard, mouse • Monitor resolution: 1024 by 768 pixels with 65535 colors • LAN card, if workplaces are connected
Recommended options	• Backup device for manual data backup: CD-Burner • Backup device for automatic data backup: External hard disk
Operating system	• Microsoft Windows® 2000 Professional with service pack 3 at minimum • Microsoft Windows® XP.

Table 8: PSM 501 station server

Minimum requirements on the hardware used	• Intel Pentium – 733 MHz CPU or equivalent • 256 MBytes RAM • 4 GBytes hard disk storage for SW and operating system storage. Capacity for disturbance records is not considered hereby • CD-ROM drive • Keyboard, mouse • Monitor resolution: 1024 by 768 pixels with 65535 colors • LAN card, if workplaces are connected
Recommended options	• 512 MBytes RAM
Operating system	• Microsoft Windows® 2000 Professional with service pack 3 at minimum • Microsoft Windows® XP.

Other relevant documents

[1] Inform^{IT} Power System Monitoring Workplaces
PSM 510, PSM 511, PSM 530, PSM 550 1MRB520375-Ben

[2] Inform^{IT} Power System Monitoring
Stand-alone Fault Analysis and Evaluation Tool PSM 505 1MRB520376-Ben

[3] Substation Monitoring System SMS 530 1MRB520268-Ben

[4] Simplewire company http://www.simplewire.com

[5] Simplewire network coverage
http://www.simplewire.com/developers/knowledge/reference/coverage/

Inform^{IT} Power System Monitoring

Central Server, Station Server

PSM 500, PSM 501

Technical Data

1MRB520355-Ben

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