MicroSCADA Pro SYS 600C 2.93
Product Guide

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Contents

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2 Introduction

2.1 This manual

This manual provides product information on the Compact System SYS 600C (later referred to as SYS 600C). It gives an overview of the product functionality, key benefits, application areas, technical details, and capacity and performance.

2.2 Use of symbols

This publication includes warning, caution and information symbols where appropriate to point out safety-related or other important information. It also includes tips to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:

Warning icon indicates the presence of a hazard which could result in personal injury.

Caution icon indicates important information or a warning related to the concept discussed in the text. It might indicate the presence of a hazard, which could result in corruption of software or damage to equipment/property.

Information icon alerts the reader to relevant factors and conditions.

Tip icon indicates advice on, for example, how to design a project or how to use a certain function.

Although warning hazards are related to personal injury, and caution hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, comply fully with all warnings and caution notices.

2.3 Related documents

Name of the document	Document ID
SYS 600 9.3 IEC 61850 System Design	1MRS756664
SYS 600 9.3 Installation and Administration Manual	1MRS756634

Name of the document	Document ID
SYS 600 9.3 System Configuration	1MRS756646
SYS 600C User's Guide	1MRS757728

2.4 Document revisions

Revision	Product Version	Date	History
A	2.93	16.11.2012	Document created
B	2.93	25.11.2013	Minor corrections

3 Functional overview

SYS 600C is a modular and scalable automation system that can be configured and tailored for various applications and needs. This chapter gives an overview of the main functionality.

3.1 Process communication

The process communication is used to connect various process devices, such as IEDs, RTUs, PLC, and Meters to SYS 600C. A large selection of communication protocols and interfaces, such as IEC 61850, IEC 60870-5-10x, DNP 3.0, Modbus, LON, and SPA are supported. See Section 5.2.1 Communication protocols for the full list of supported protocols.

The process communication is used to retrieve data from the connected devices, such as status indications, events, and analog values, as well as to write data to the devices, such as commands, set points, and parameters. The data retrieved through the process communication can be archived, presented on the HSI, or forwarded to other systems.

See Section 3.9 OPC connectivity for more connectivity options.

3.1.1 Remote communication

The remote communication is used to connect SYS 600C to upper level systems, such as Network Control Systems. The most common protocols, such as IEC 60870-5-101/104, DNP 3.0, and MODBUS are supported.

See Section 5.2.1 Communication protocols for the full list of supported protocols.

3.1.2 Communication gateway

The communication gateway functionality provides a gateway between process devices and up to eight upper level systems (NCC). The main tasks of the gateway are signal rerouting and protocol conversions. SYS 600C also supports signal grouping and possibility to introduce custom mapping logic in the gateway engine.

The following table lists the protocols that are supported by the gateway engine.

Table 3.1: Protocols supported by the gateway engine

Protocol	Type
SPA	Master
LAG 1.4 (LON)	Master
IEC 60870-5-101	Master and slave
IEC 60870-5-103	Master

Protocol	Type
IEC 60870-5-104	Master and slave
IEC 61850-8	Client
ANSI X3.28 - AB (ABB)	Master
RP 570/571	Master and slave
DNP 3.0 (Subset 3)	Master and slave
Modbus	Master and slave
OPC DA, A&E	Client
OPC DA, A&E	Server

3.2 SYS 600C workplaces

3.2.1 Workplaces

SYS 600C can be equipped with 1 to 5 workplaces to be used at the same time. The workplace provides means for the operator to configure the system and supervise and interact with the process. Each SYS 600C computer can have a local workplace, but the workplaces can also be distributed to other computers and locations.

The workstations can be distributed over a network using TCP/IP. It can be a LAN, internet, or mobile wireless communication.

Each workplace can be used for engineering, supervision, and operation of the process. The possibilities are defined by the access rights given to the user in question. Also the layout and functions of the workplaces can be fully customized for each user.

The distributed workplace concept is based on available remote access techniques, typically Remote Desktop Services. Any PC or other web-enabled device can be used as a workstation without installing any additional software.

3.2.2 Process Display

One of the display types of the workplace is the process display. The process display is used to represent the process and primary equipment, typically as a single-line diagram with graphical symbols for primary devices, such as breakers, disconnectors, and transformers. The process display is normally built with symbol libraries, but also customized symbols and displays can be built.

The process display supports zooming, panning, and decluttering for efficient and clear visualization of the information.

Through the process display the user can continuously monitor the process, such as switches and measurements, as well as access the control dialogs to issue commands, set parameters, and so on.

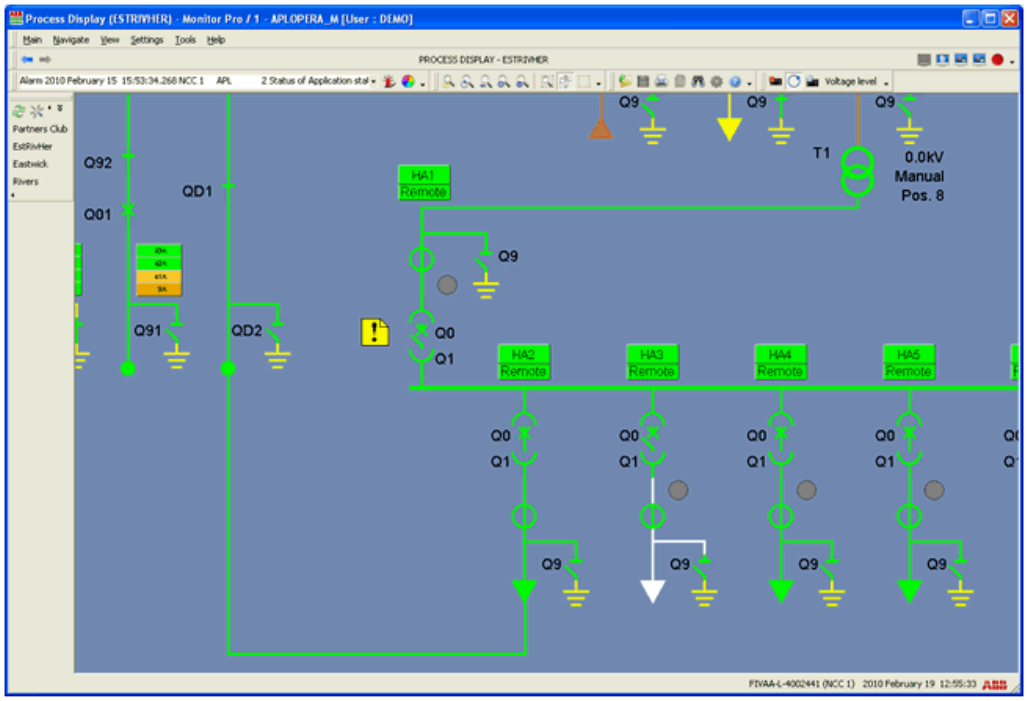

Figure 3.1: Process Display

3.2.2.1 System Self Supervision

The System Self Supervision function shows the status of the various system components in a display for easy and fast system maintenance and fault localization. The display shows information about the base system, applications, redundancy, communication lines, IEDs, and so on. The system can also receive status information from any device or external software reporting to the Windows event log, for example, disks, power supplies, and computer boards. Communication equipment and peripheral devices that support SNMP can also be supervised by using a third party product SNMP-OPC gateway.

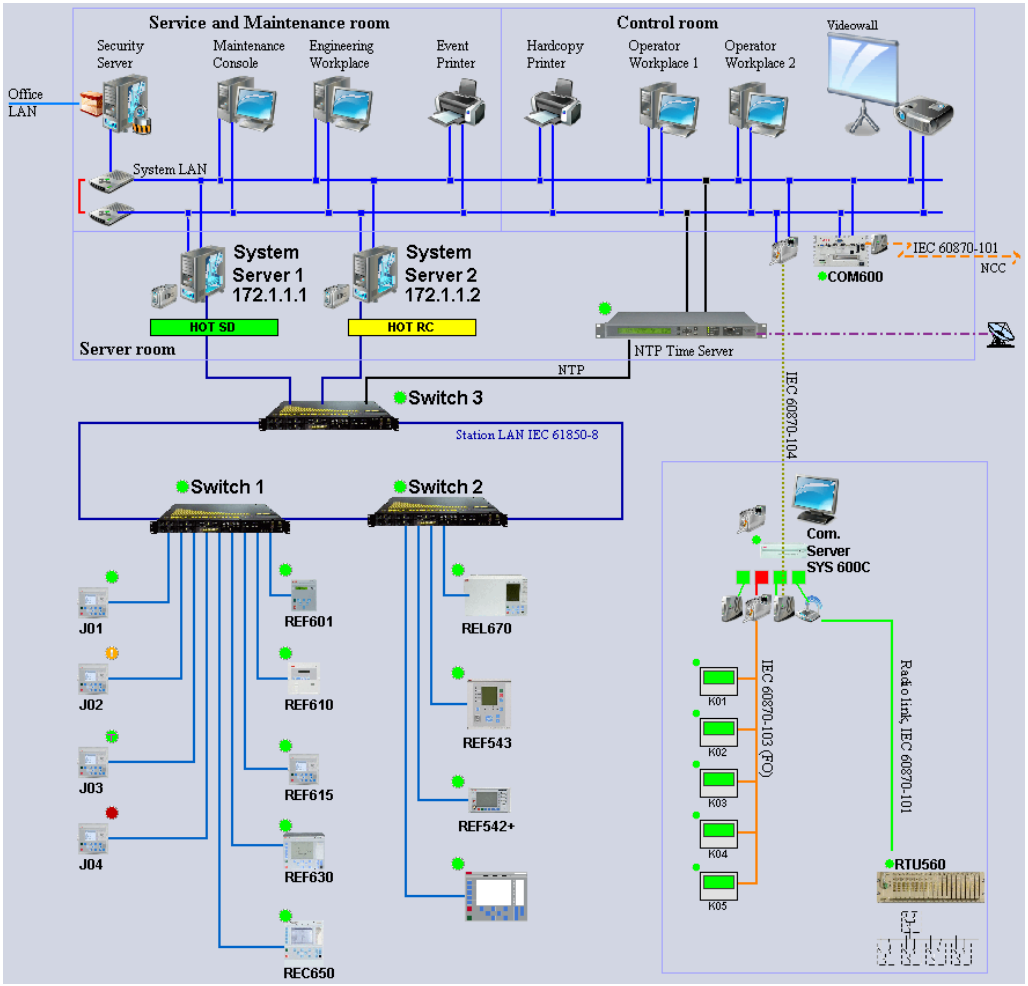

Figure 3.2: An example of typical system supervision display

3.2.3 Event Display

With the Event Display you can monitor the information about events occurring in the system. Thus, you can make the right decisions and verify that taken measures have been successfully performed. You can also receive information about activities carried out by other users, operations of objects, acknowledging of alarms, editing of limit values, logging in, and all other type of events which can occur..

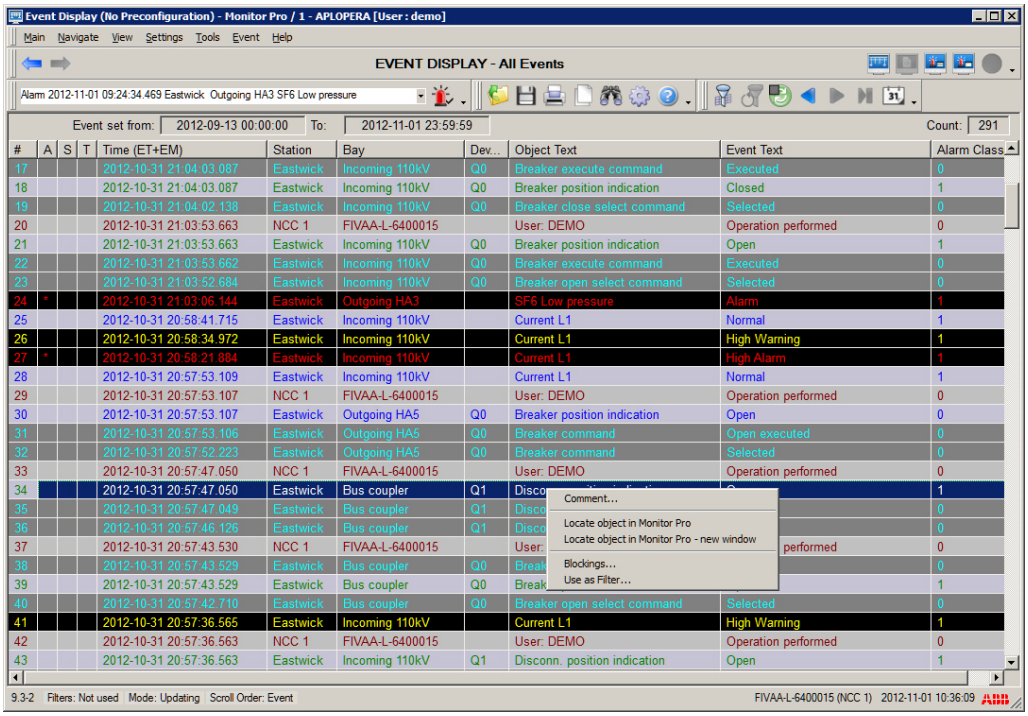

Figure 3.3: Event Display

The Event Display presents the data in a structured way for the user's convenience. Each event is one row in the display. With default settings Event Display rows consist of a time stamp, object identification, a signal text and a text indicating the status.

3.2.4 Alarm Display

The Alarm Display shows a summary of the present alarm situation of the supervised process. Each alarm is normally presented as an alarm text row, which describes the cause of the alarm in the process. With default settings the alarm text row normally has a time stamp, an object identification, an object text and text indicating the alarm status. See Figure 3.4 for Alarm Display Template 1 and Figure 3.5 for Alarm Display Template 2.

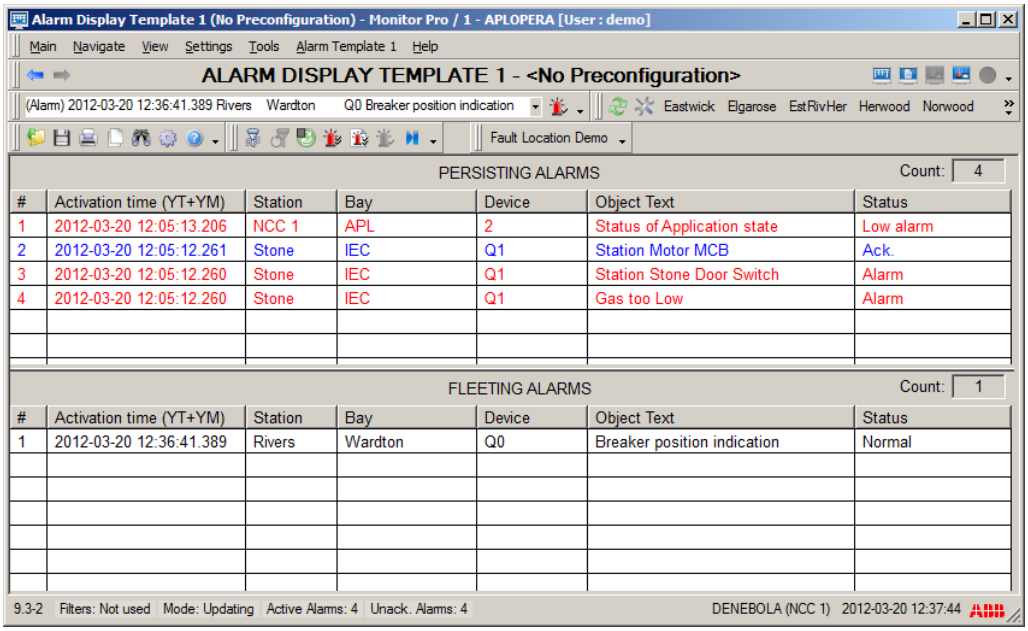

Figure 3.4: Alarm Display Template 1

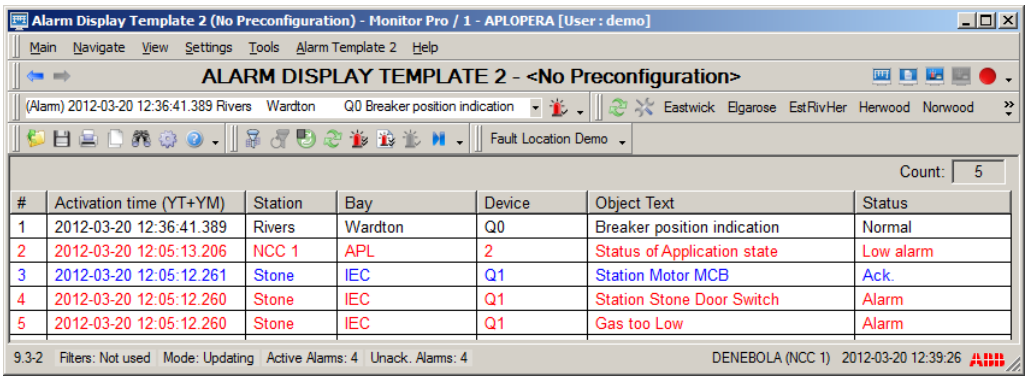

Figure 3.5: Alarm Display Template 2

The Alarm Display contains the following features and options:

- Two types of Alarm Display templates
- Filters
- Alarm Display setting tool for colors and text layout
- Updating/Frozen modes
- Alarm acknowledgement
- Alarm reset function
- Authorization support
- Help in all dialogs (The complete manual will be opened from Help)
- Visible Alarm Class
- Locate object in DMS
- Locate object in Monitor Pro

- Column sort
- Find

3.2.5 Blocking Display

The Blocking Display summarizes the present blocking situation of signals in the supervised process. Each signal is presented as a signal row, which describes the signal in the process. The signal text row normally consists of a signal text and a group of check boxes indicating the blocking state. Figure 3.6 shows the Blocking Display main view.

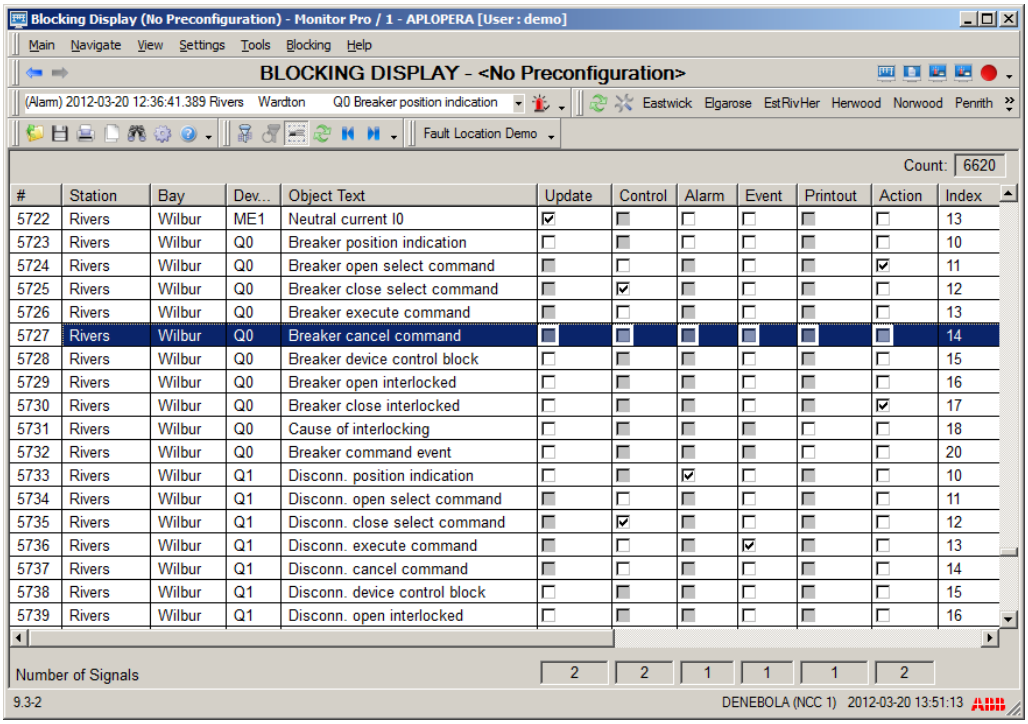

Figure 3.6: The Blocking Display main view

The Blocking Display contains of the following features and options:

- Selection of signal(s) for blocking/deblocking
- Blocking Display setting tool for the view layout
- Printout of blocking situation
- Event and printout enabling/disabling
- Authorization support
- Possibility to copy contents on the clipboard of the operating system
- Help in all dialogs (the complete Operation Manual will be opened)
- Locate object in DMS
- Locate object in Monitor Pro
- Column sort
- Find

3.2.6 Trends Display

The Trends Display is used for trend analyses and for showing measured values in the form of a curve or a table.

A trend is a time-related follow-up of process data. All types of process objects, for example in and out data, binary, analog and digital data can be illustrated as trends.

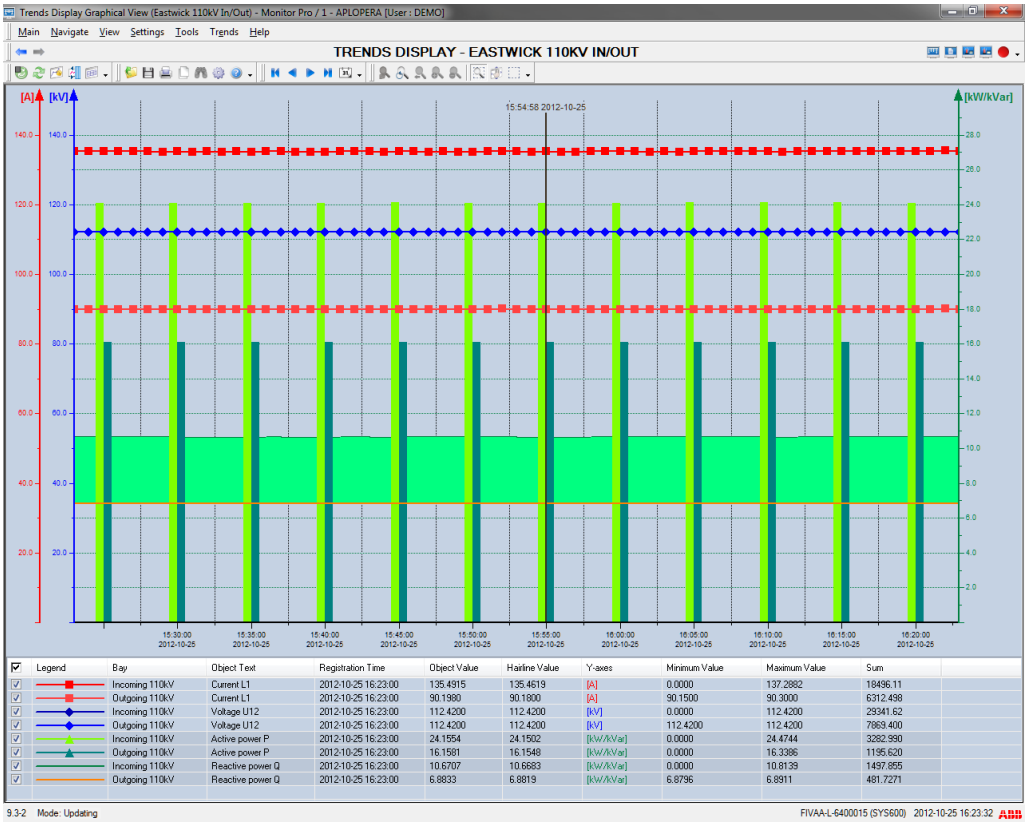

Figure 3.7: The Trends Display

The Trends Display contains the following features:

- Graphical or tabular view
- Zooming mode
- Scrolling with scroll bars and panning
- Configurable axes and line properties
- Using legend
- Using hairline
- Update interval options from 10 seconds to 10 minutes
- Calculation formulas; direct, mean, sum, integral and difference
- Clearing trend data by the user
- Save, Open and Delete preconfigurations
- Printout option
- Update/Frozen modes

- Authorization support
- Copy to clipboard
- Export to CSV file

3.2.7 Measurement Reports Display

The measurement reports display is an application that collects data and visualizes the data in a numerical or graphical form. The measurement reports display is used to log and report data during longer periods than the Trends Display, and it is dedicated for energy, current, voltage, temperature, and frequency reports.

The available time ranges for the reports:

- Hourly report (time resolution: 1, 2, 3, 5, 6, 10, 15, 20 or 30 minutes)
- Daily report (time resolution: 10, 15, 30 or 60 minutes)
- Weekly report (time resolution: 1 day)
- Monthly report (time resolution: 1 day)
- Yearly report (time resolution: 1 month)
- Quick Report on an hourly basis (time resolution: according to a period cycle)
- Quick report on a daily basis (time resolution: according to a period cycle))
- Quick report on a weekly basis (time resolution: 1 day)
- Quick report on a monthly basis (time resolution: 1 day)
- Quick report on a yearly basis (time resolution: 1 month)

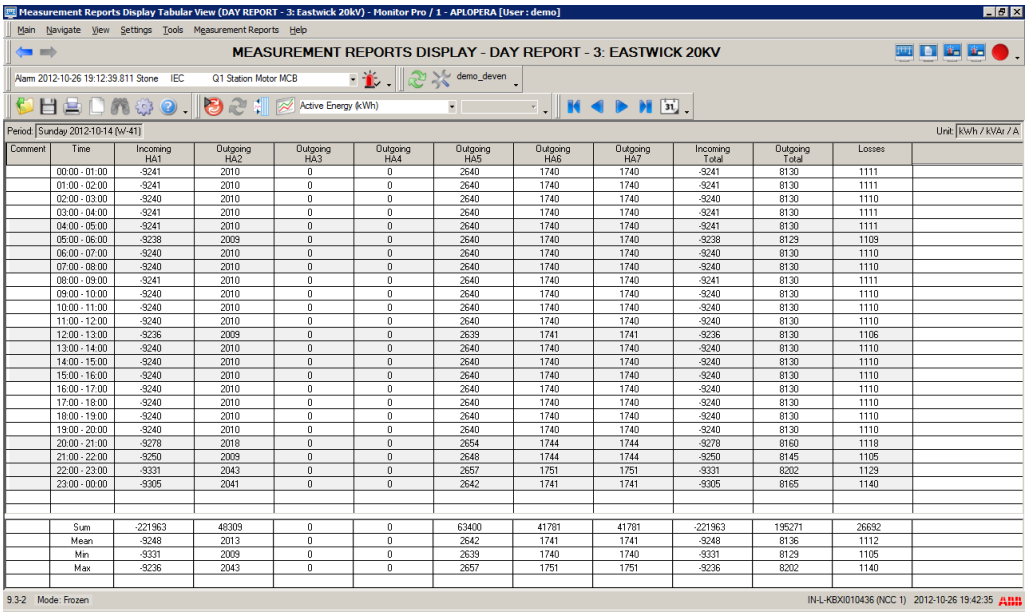

Figure 3.8: Measurement Reports Display

3.3 Historian

Historian is a subsystem dedicated for fast and efficient data logging, data refinement and information visualisation. The flexible Historian can store all process data for long periods and refine the data into meaningful information. This gives a clear view of the situation in the primary process, allow for optimized utilization of energy and equipment as well as produce reports and statistics. The information is visualized in the form of various graphs, trends, and numerical reports. The numerical reports can utilize embedded Microsoft Excel which provides commonly known tools for further data refinement.

3.3.1 System configurations

Historian should primarily be used on a dedicated server. The data sources for Historian are Process Objects or Data Objects of SYS 600C. The data is transfer from SYS 600C to the Historian over a TCP/IP LAN. One SYS 600C application can log data into one or several Historian instances and one Historian instance can receive data from one or several SYS 600C devices.

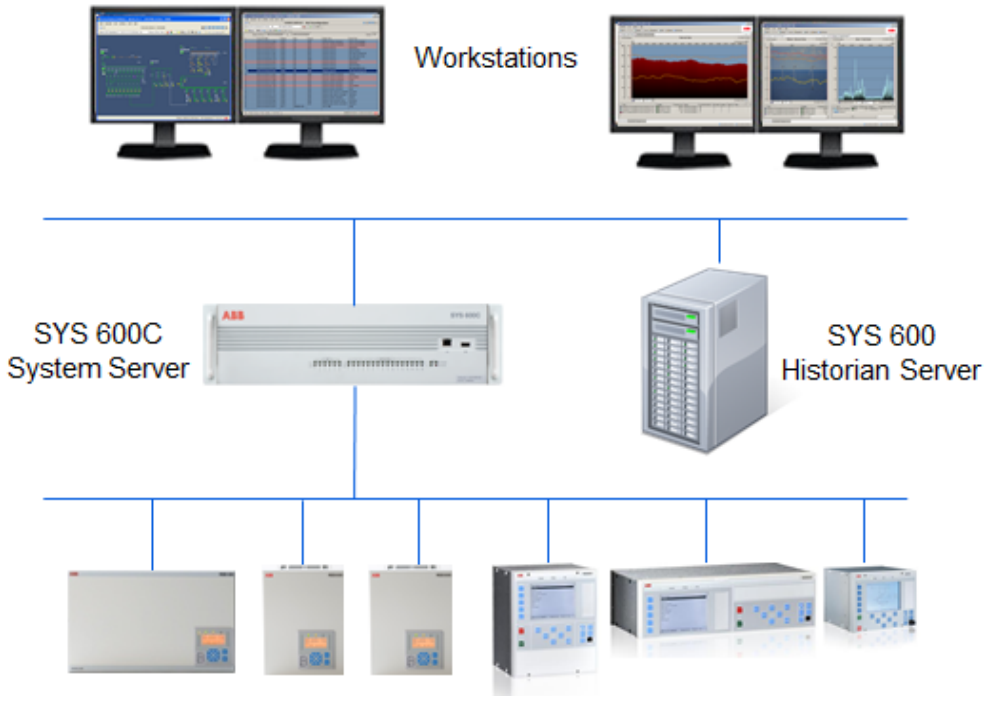

Figure 3.9: Historian System Configuration

3.3.2 Data logging

Historian logs data from the SYS 600 Application and more precisely from Process Objects or Data Objects. The data logging is triggered by the update of the Process Object

or Data Object. The following data types can be logged in the Historian: Process Objects: binary input (BI), binary output (BO), double binary input (DB), digital input (DI), digital output (DO), analog input (AI), analog output (AO), pulse counter (PC), Data Objects with numerical value.

Historian logs the raw data (all updates) from the sources during 8 days. The raw data is then refined into long term storage like 1 minute average, 2 minute maximum, 1 hour minimum, etc.

3.3.3 Visualisation

Visualisation of the logged and refined data is done by means of various graphs and tables. The graphs can be freely configured in terms of graphical representation, axes types and orientation, update rates, etc. The numerical tables are utilising Microsoft Excel and provides flexible configuration and data manipulation possibilities.

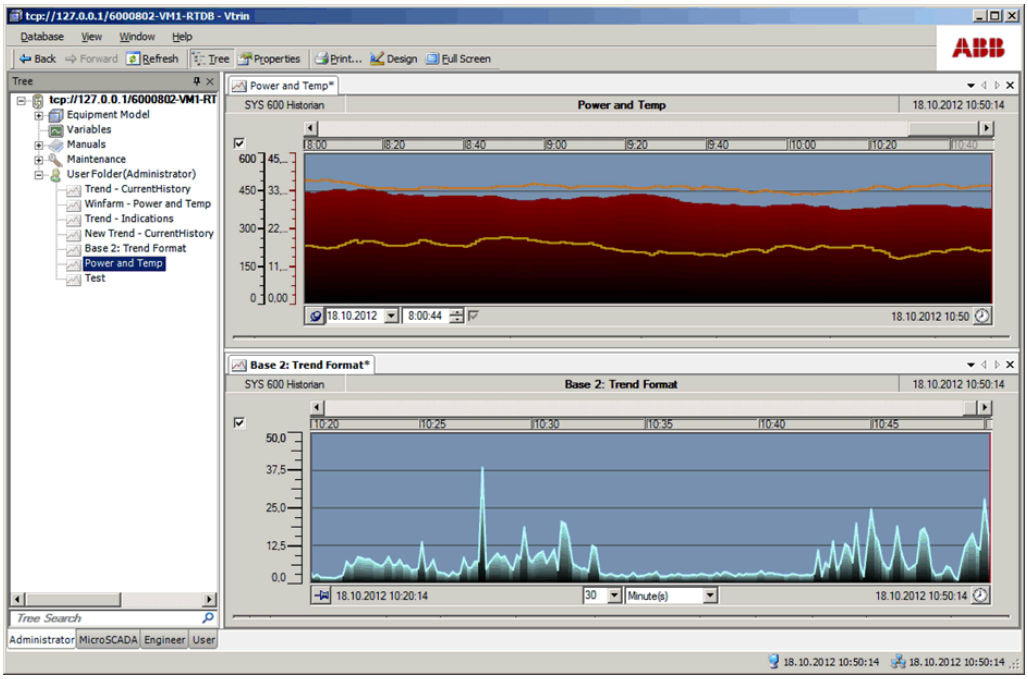

Figure 3.10: An example of Historian graphs

3.4 User management

Users of the system are given access rights according to the needs. The user sessions can be limited in time. The users can be given the right to view, control, or configure the different parts of the system or process.

3.5 Localization

It is possible to translate the user interface to any language that fits into the boundaries of the graphical user interface, that is, size, position, and direction of texts and icons. The system also supports several languages simultaneously enabling operators to work with the system in their native language. The language is part of the user profile and is selected automatically while logging into the system.

3.6 Time synchronization

SYS 600C can be synchronized by an external GPS clock. This is typically done using SNTP over the local area network or through a serial port using a protocol provided by the clock manufacturer. It is also possible to add a PCI card into the computer to retrieve the clock signal. The IEC 61850 client of SYS 600C includes an SNTP client that can be used to set the system clock. SYS 600C can also be synchronized by the Network Control System over a remote communication protocol.

SYS 600C can also be used as a clock master for the connected IEDs according to the used protocol.

3.7 Redundancy

3.7.1 System redundancy

The availability of a SYS 600C system can be further improved by redundant servers configured in a hot stand-by mode (HSB). In this configuration, one computer is active and receives and processes all data from the process. It also manages the displays and provides data for the displays. At the same time, all process data and configuration data is shadowed over to the stand-by computer. The stand-by computer is in the same state as the active one. If the active computer breaks down, the stand-by computer takes over the process communication and continues to manage the process. In this way, the process can be operated and supervised even if one of the computers fails.

3.7.2 Communication redundancy

Redundant communication lines mean that two or several connections between the master and the slave form a logical connection. One of the connections is active and if the active connection fails, another connection is used instead.

Redundant communication lines are supported for IEC 60870-7-101 slave, RP-570 slave, and IEC 60870-7-104 master and slave protocols.

Redundant LAN connections are supported for, for example, IEC 61850 communication using dual LAN connections according to IEC 62439/PRP. See SYS 600 IEC 61850 System Design for details.

The network chipset used in the SYS 600C supports Intel Teaming with Advanced Networking Services. Teaming can be used to provide additional fault tolerance in case of a port or a switch failure, as well as for load balancing and link aggregation. The restrictions and possibilities of interface teaming are described in the Intel Advanced Networking Services documentation.

3.8 Mirroring

The process data mirroring provides powerful means for sharing process data in a SYS 600C/SYS 600 network with minimal engineering effort. This can be used to build hierarchical systems, for example, with one main control center, some regional control centers and more local control centers or substations. It can also be used for load distribution in large systems. The data mirroring can also be used to share data between a SYS 600C HSI and SYS 600C Gateway, for example, when communication protocols with one master are used.

The advantage of using data mirroring instead of standard communication, such as IEC 60870-5-104, is that the data mirroring communication is much more efficient and the required engineering work to build up the system is minimal. Several special functions, such as event buffering during communication breaks and handling of hot stand-by configurations, are automatically taken care of.

The data mirroring takes place between a host and an image. The host is the source for the process data and the image is a copy of the process data. The SYS 600C node that receives the process data, for example, through IEC 61850 or LON, is the host. This process data can be mirrored to another SYS 600C node, which acts as an image.

3.9 OPC connectivity

OPC is a de-facto interface standard connecting various devices and systems within the process automation industry. OPC is becoming more and more used and accepted also in other application areas and within the power industry. It defines exchange of data between a server and a client. The server provides data and the client uses the data. The client can also write data (commands, parameters, and so on) to the server.

SYS 600C provides OPC connectivity both in forms of clients and servers, that is, SYS 600C can receive data from a device or system that provides its data through an OPC server. SYS 600C can also provide its data to another system that acts as a client.

3.10 Cyber security

The product is designed to fulfill high cyber security requirements. It supports the following functions:

- User authentication:
  - Encrypted user name and password

  - Configurable password policies
  - Configurable logon/warning banners
  - Configurable session time-out feature
- User Authorization: Users can be granted access rights to functions as required
- Communication encryption: Encryption of TCP/IP connections (IPSec/VPN)
- Virus protection
- Patch management
- System hardening:
  - Application whitelisting
  - Firewall
  - Closing of unused ports and services
  - Security policies
  - Robustness testing as an integrated part of the development process

For more information, see SYS 600 Security Guide.

3.11 Key benefits

SYS 600C offers the following highlights and key benefits:

- Solid-state hardware technology
  - Enables use in harsh environments
  - Reduces maintenance needs
  - Support for wide operating temperature range
- High availability
  - Proven and tested hardware with high MTBF value
  - Support for redundant (Hot Stand-By) system servers
  - Support for redundant remote communication lines
  - Support for redundant power supplies for both AC and DC power supply
- Engineering efficiency
  - Integrated tools for system engineering, for example expansion of databases, communication system, HSI clients, and users
  - Support for third-party software and hardware through the use of open interface and communication
  - Easy to upgrade with latest software versions that enable use of new and innovative functionality
- Scalability
  - Enables system sizes ranging from tens to thousands of data points
  - Flexible system configuration, ranging from communication gateway to control system HSI solution with integrated communication gateway functionality to communication server in large SA system and network control system
  - Conformance to a wide range of communication standards and de-facto communication standards
  - Powerful hardware with large number of serial and ethernet interfaces
- Powerful HSI

- Powerful data collection to be used in single line diagrams, process displays, trends, reports, control, alarms, and events
- Process displays with support for zoom/pan/de-clutter
- Trends with zoom/pan, multiple graph types, ruler, cut, and paste

4 Application areas

4.1 Overview

SYS 600C provides innovative solutions for different tasks and operations in the power automation process, from Communication Gateway functionality to full-fledged redundant control system applications. SYS 600C is a solid-state computer utilizing information distributed in different locations and hence enabled for a large variety of tasks. SYS 600C is suitable in, for example, Substation Automation Systems for both Utility and Traction applications, as well as in Process Industries with distributed Intelligent Electronic Devices (IEDs). SYS 600C is also designed to be used as a Communication Server in medium and large Remote Control Systems (SCADA).

SYS 600C is designed as an open system, which complies with all widely used communication standards. In addition, it supports the implementation of project-specific monitoring, control, and automation tasks in the field of Substation Automation and Power Automation. The SYS 600C Human System Interface provides an intuitive and easy-to-use user interface for efficient and safe operator actions.

The consistent use of known technologies and intuitive user interfaces ensures an easy entry level for new SYS 600C users.

4.1.1 Fields of application

SYS 600C is designed to be used in a wide range of applications in both Electrical Utilities and Industries.

When using SYS 600C in substations, the main application is as a Communication Gateway to the upper level system or it is used as a powerful Control System HSI. The two can also be combined in the same SYS 600C system and forms hence a combined Communication Gateway with Control System HSI. SYS 600C can be used in any type of substation.

In large substations and in medium- and large-sized remote control systems, SYS 600C, thanks to the large amount of communication ports, is an unbeatable Communication Server solution (also known as a front-end computer).

SYS 600C fits also well into various types of control applications, especially where a solid-state type of computer is required and different kinds of distributed Intelligent Electronic Devices (IEDs) together with other type of bay devices (RTU) are to be connected to the system. Connections to process automation systems are well supported in SYS 600C thanks to OPC server and client integration.

4.2 SYS 600C as Communication Gateway

SYS 600C is used for multiple purposes at a substation level. The Communication Gateway function is one of the tasks that can be utilized at the substation level to enable connections to Remote Control Centers (SCADA). SYS 600C Communication Gateway can connect to, and interact with, eight (8) different Remote Control Centers.

The SYS 600C Communication Gateway function can be configured as a single gateway as shown in Figure 4.1.

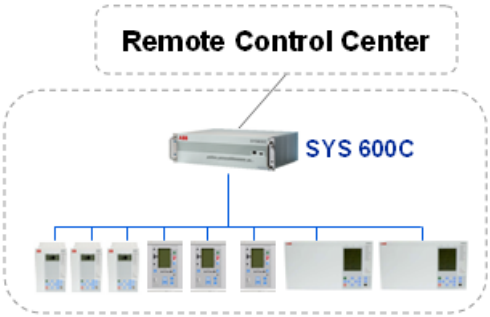

Figure 4.1: SYS 600C as Communication Gateway

Utilizing the OPC interface in SYS 600C enables an easy and efficient integration of IED signals and information into a DCS system, as shown in Figure 4.2.

This configuration is typically applied in Process Industries with distributed Intelligent Electronic Devices (IEDs).

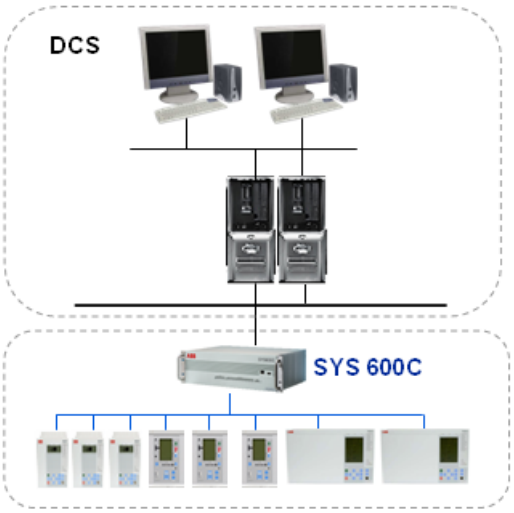

Figure 4.2: SYS 600C Communication Gateway interface to Distributed Control Systems (DCS)

For increased availability, SYS 600C can easily be configured as a redundant Communication Gateway as shown in Figure 4.3.

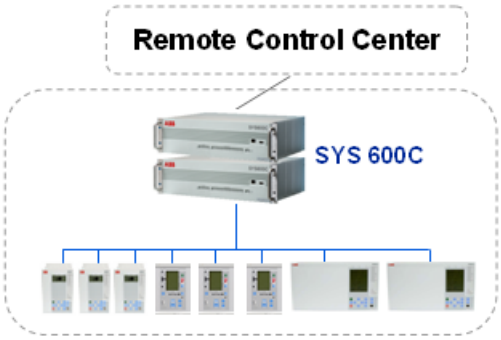

Figure 4.3: SYS 600C as Redundant Communication Gateway

SYS 600C also supports redundant remote communication lines between SYS 600C and Remote Control Center as shown in Figure 4.4.

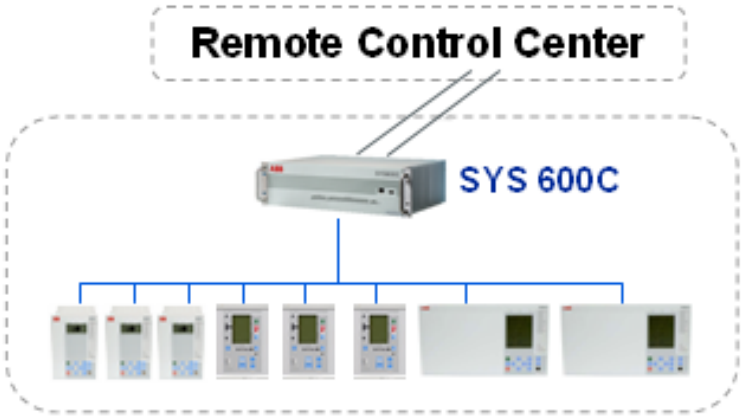

Figure 4.4: SYS 600C as Communication Gateway with redundant communication lines to Remote Control Center

4.3 SYS 600C as Control System HSI

SYS 600C HSI provides numerous options for monitoring and controlling a connected process. SYS 600C handles both the HSI functionality and the Communication Gateway functionality. In this way SYS 600C can act both as a Communication Gateway, enabling a remote connection to control centers, as well as the local control system and HSI user interface on a station level.

The SYS 600C HSI function can be configured as a single and local Control System HSI configuration as shown Figure 4.5.

Figure 4.5: SYS 600C as Control System HSI

To reduce the number of devices at the substation level, SYS 600C Control System HSI and the Communication Gateway function can be combined in the same computer as shown in Figure 4.6.

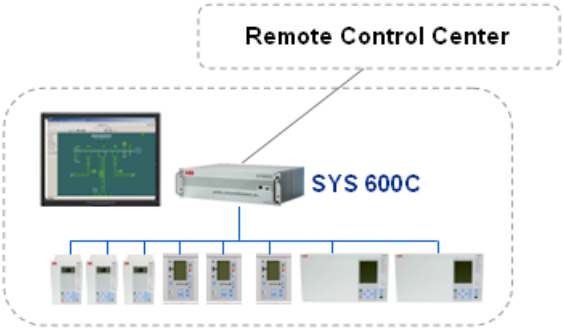

Figure 4.6: SYS 600C as combined Control System HSI and Communication Gateway

For increased availability, SYS 600C can be configured as a redundant Control System HSI and integrated Communication Gateway with redundant communication lines to Remote Control Center as shown in Figure 4.7.

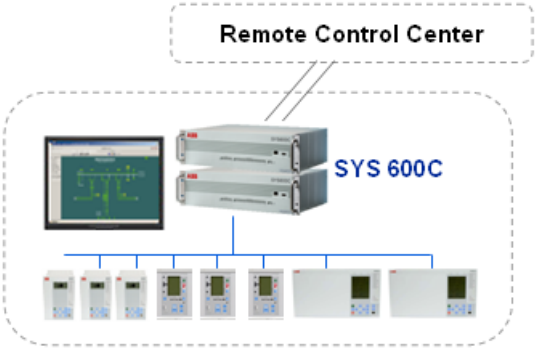

Figure 4.7: SYS 600C as redundant Control System HSI and integrated Communication Gateway

SYS 600C can also be utilized as an HSI for station RTU as shown in Figure 4.8.

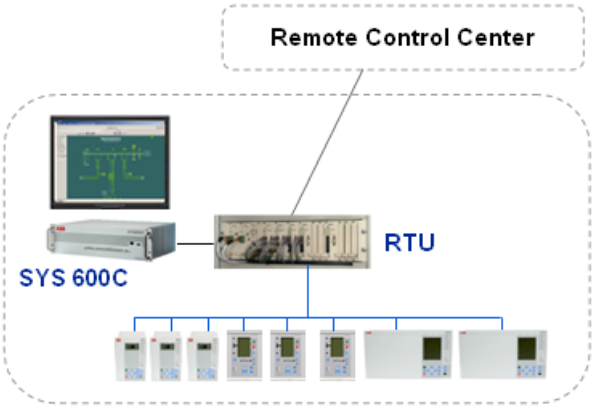

Figure 4.8: SYS 600C as Control System HSI for RTU

4.4 SYS 600C as Communication Server

SYS 600C can function as a powerful Communication Server in medium and large Remote Control Center configurations as well as in large Substation Automation applications.

SYS 600C with its large number of serial communication ports and LAN ports in combination with the solid-state technology offers an excellent Communication Server solution. The Communication Server solution is offered and available as a part of larger SYS 600 or SYS 600C configurations as shown in Figure 4.9 and Figure 4.10.

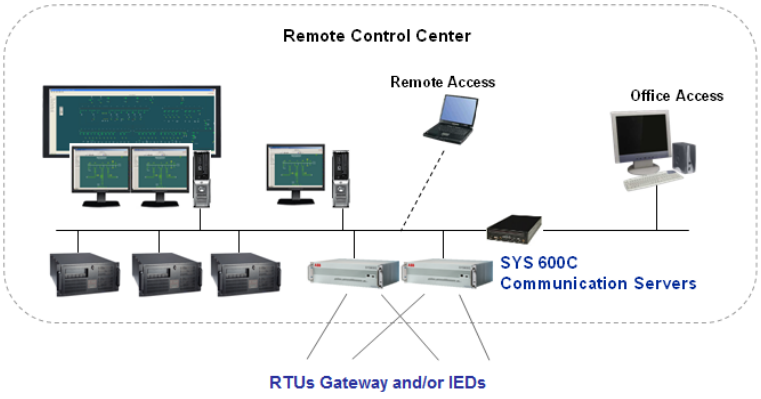

Figure 4.9: SYS 600C as Communication Server in a Remote Control Center system

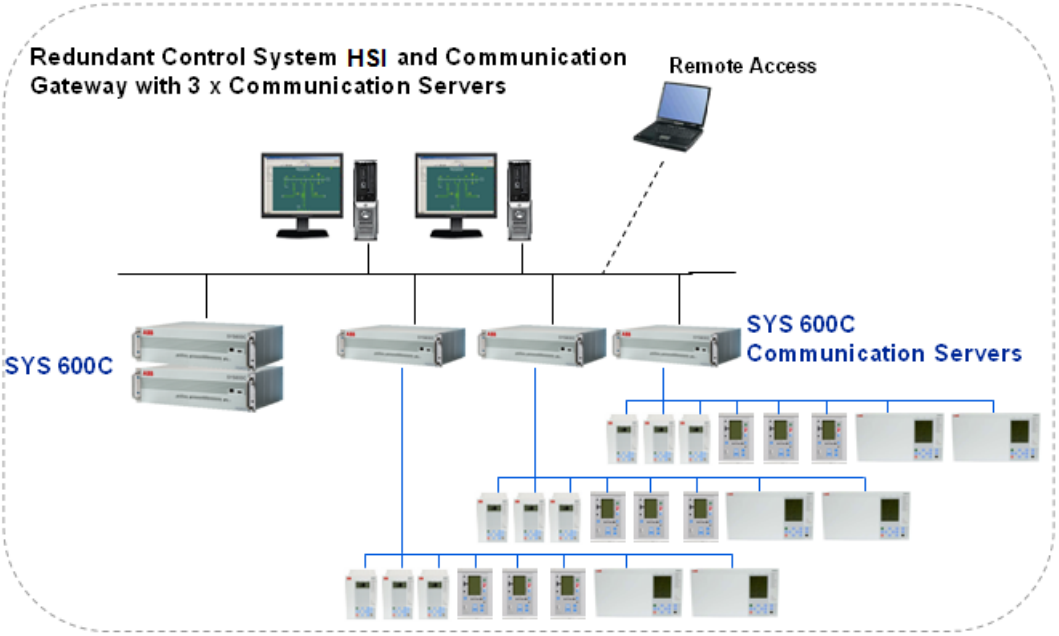

Figure 4.10: SYS 600C as Communication Servers in a large Substation Automation system

By utilizing the SYS 600C Communication Server solution the processing load in the main system servers SYS 600 or SYS 600C is reduced. The Communication Servers are connected to the process devices and provide the main system servers SYS 600 or SYS 600C with process information.

5 Product structure

5.1 Ordering, delivery, and life cycle policy

SYS 600C is a product that combines the robust solid-state computer with the operating system and the SYS 600 software.

5.1.1 Computer

The computer exists in a number of fixed configurations that is selected during ordering. The fixed configurations concern the parts supplied by the ABB product unit. There are no options that can be ordered separately.

To replace the faulty SYS 600C computers, customers with SYS 600C products can only order a SYS 600C spare computer without the SYS 600 license. If the SYS 600C computer configuration needs to be changed for some reason, the only possibility is to order a spare computer and replace the original one with the spare one.

SYS 600C has three PCI slots for additional PCI cards. SYS 600C does not include any additional cards by default. Additional cards, such as the PCLTA card, can be purchased from external suppliers.

5.1.2 Operating systems

The operating system can be upgraded after the delivery. The operating system upgrades are not delivered from the ABB product unit, but can be purchased from an external supplier. The operating system must be compatible with both the computer and the SYS 600 software. Operating system security updates and service packs are tested and verified by ABB. For more information, see SYS 600 Security Guide.

5.1.3 SYS 600 software

The SYS 600 software can be extended or upgraded to new versions. This is done with the normal ordering tool with the upgrade/extension options. SYS 600 Hotfixes, and Service and Feature Packs can also be freely taken into use. New SYS 600 versions will be available for the SYS 600C hardware for at least 4 years after the hardware delivery. After that new SYS 600 software versions may require an upgrade of the hardware.

The SYS 600 software license is bound to the Hardware Key that is installed inside the computer.

5.1.4 Product identification

The SYS 600C product is identified by the computer version and the SYS 600 software version.

Example: SYS 600C 2.93 Hardware version 2, SYS 600 software version: 9.3

5.2 Software options

5.2.1 Communication protocols

The following tables list the communication protocols of SYS 600C.

Table 5.1: Master protocols

Master protocol
IEC 61850-8-1 Client
LON/LAG
SPA Bus
IEC 60870-5-101
IEC 60870-5-103
IEC 60870-5-104, Single or redundant
DNP 3.0 LAN/WAN
DNP 3.0 Serial
Modbus RTU
Modbus TCP/IP
RP 570/571
ANSI X3.28 FD/HD
P214
ADLP 180
IEC 61107 (metering)
Alpha Meter protocol
RCOM

Table 5.2: Slave protocols

Slave protocol
IEC 60870-5-101, Single or redundant
IEC 60870-5-104, Single or redundant
DNP 3.0 LAN/WAN
DNP 3.0 Serial
RP 570 Single or redundant/RP 571 Single

Slave protocol
F4F Westinghouse, No gateway support
Modbus RTU
Modbus TCP/IP

5.2.2 HSI features

The following table lists the SYS 600C HSI features.

Table 5.3: User interface options

User interface option	Description	Value
Nr of Pro workplaces	This is the number of workplaces that are in use simultaneously. The number of workplaces needed is defined in the following way: - A workplace means a computer (PC, Laptop, PDA, ThinClient), which can have one or several physical screens from where ONE person at a time can operate. - Several Application Windows can be used in one workplace.	0...10
Process displays	Select this option, if you want to use Process Displays in the workplaces. Process Displays means displays with zooming, panning, and decluttering functions typically used to present the primary process, for example, single-line diagram.	Yes/No
Network coloring	Select this option, if you want to use dynamic network coloring in the Process Displays.	Yes/No
Trends	Select this option, if you want to use the Trend displays in the Workplaces.	Yes/No
Event list	Select this option, if you want to use the Event List displays in the Workplaces.	Yes/No
Alarm list	Select this option, if you want to use the Alarm List displays in the Workplaces.	Yes/No
Blocking list	Select this option, if you want to use the Blocking List displays in the Workplaces.	Yes/No
Measurement reports	Select this option, if you want to use the Measurement Report displays in the Workplaces. This option requires the History Data Logging option.	Yes/No
PCM600 interface	Select this option, if you want to integrate PCM600 Tools in the Process Displays.	Yes/No
LIB 510/542 IED Tools	Select this option, if you want to integrate LIB 510/542 IED Tools in the Workplace. If you use only the IED tools in the Workplace, no other LIB license in needed.	Yes/No
LIB 520 IED Tools	Select this option, if you want to integrate LIB 520 IED Tools in the Workplace. If you use only the IED tools in the Workplace, no other LIB license in needed.	Yes/No

User interface option	Description	Value
LIB 530 IED Tools	Select this option, if you want to integrate LIB 530 IED Tools in the Workplace. If you use only the IED tools in the Workplace, no other LIB license in needed.	Yes/No

5.2.3 System functions

The following tables list the SYS 600C system functions.

Table 5.4: System size parameters

System size parameters	Description	Value
Process I/O	Number of process objects connected to the process	1..20 000 Gateway functionality (COM 500i) supports maximum 14 000 indications and 14 000 commands configured within SYS 600C.

Table 5.5: System options and interfaces

System option and interface	Description	Value
Control	This option enables control commands to be issued from the system. This option should normally be selected. This option can be left out in pure monitoring systems, where no output process objects are needed. You also need this option in gateway systems, if commands are propagated through the gateway.	Yes/No
History Data Logging	This option is needed for example, for the Measurement Reports. This option is not needed for the standard Trends. Without this option, the number of Data Object entries is limited to 100 000.	Yes/No
Hot-Stand-By redundancy (HSB)	Select this option, if you have a redundant pair of servers using the Hot-Stand-By function.	Yes/No
Database mirroring HOST	This option should be selected, if the database mirroring functions are used and this system acts as a Host. The Host is the system that provides process data to another system. For example, if you use mirroring between a communication server (front-end) and a system server, the communication server is the host.	Yes/No

System option and interface	Description	Value
Database mirroring IMAGE	This option should be selected, if the database mirroring functions are used and this system acts as an Image. The Image is the system that receives process data from another system. For example, if you use mirroring between a communication server and a system server, the system server is the Image.	Yes/No
OPC DA Server	This option enables the OPC DA server function. The option should be selected, if the system is to be connected to an external OPC DA Client e.g. 800xA, HIS 600.	Yes/No
Application OPC Server	This option is primarily intended for HSB systems, to which an external OPC DA client is connected e.g. HIS 600. This Application OPC server is installed in the OPC DA Client computer and provides an OPC DA server interface that automatically connects to the Hot application of the HSB system. Note: There is NO A&E server interface in this option.	0...3
OPC A&E Server	This option enables the OPC A&E server function (Alarms & Events). The option should be selected, if the system is to be connected to an external OPC A&E Client e.g. 800xA.	Yes/No
OPC DA Client /External	This is a DA Client that is loosely coupled to the SYS 600 base system and can therefore be installed also in a separate computer. It is used to connect OPC DA servers to SYS 600. You need one client for each server that is to be connected. Note: This DA client is used with the IEC 61850 OPC server, but you do not have to select this option due to the IEC 61850 communication.	0...4
OPC DA Client	The OPC DA client is used to connect foreign devices to SYS 600 with the OPC DA interface. You need one client for each server that is to be connected. The DA client is tightly integrated with the process database and run always on the SYS 600 computer.	0...4
OPC A&E Client	The OPC A&E client is used to connect foreign devices to SYS 600 by means of the OPC A&E interface. You need one client for each server that is to be connected.	0...4
SQL Export	The SQL Export option provides a tool and functions for browsing the process database and exporting process data to a relational database. The export can be done either event based or cyclically.	Yes/No
Historian databases	This option specify the number of Historian database the system server will connect	0....10
Historian tags	This option specify the total number of tags the system server will write (in all databases together)	0....200 000
Historian workstations	This option specify the number of workplaces totally in all Historian systems the system server will write data to	0....20

5.3 Computer options

The SYS 600C computer options are presented in the following tables.

Table 5.6: Hardware

Hardware
Power Supply: 88 - 132 VAC / 45 - 160 VDC (Single or redundant)
Power Supply: 176 - 264 VAC / 200 - 370 VDC (Single or redundant)
Ethernet ports: 2 RJ45 + 4 x LC (LC 1GB only) or 6 x RJ45
Storage device: 32GB SSD (default), 64GB SSD (optional)

Table 5.7: Operating systems

Operating system
Windows 7 32-bit, English version
Windows 7 32-bit, Chinese version
Windows Server 2008 R2 64-bit, English version
Windows Server 2008 R2 64-bit, Chinese version

6 Hardware characteristics

6.1 Hardware

The following tables lists the SYS 600C hardware specifications.

Table 6.1: Hardware specifications

CPU	Intel® Core 2 Duo 2.2GHz (T7400)
Chipset	Intel® 82945GM and ICH7R
Memory	2GB DDR2
VGA	Intel® 82945 chipset integrated graphic controller
BIOS	Award BIOS
Storage device	32GB SSD (default), 64GB SSD (optional)
Expansion slot	3 x PCI v2.3 slots
Serial ports	16 x RS232 at rear panel
LAN ports	Option 1: 2 x RJ45 + 4 x LC (LC 1GB only) Option 2: 6 x RJ45
USB 2.0	2 x USB at rear panel 1 x USB at front panel 1 x USB internal
Audio	AC97 2.1
Keyboard/Mouse	PS/2
LC module data	SYS 600C uses the optical industrial grade SFP connector module FTM-8012C-SLiG from Source Photonics (Fiberxon). Module details: Data rate 1250Mb/s, wavelength 850nm, multimode, temperature range -40°C ~ +85°C (-40°F ~ 185°F)
Power supply	88 - 132 VAC / 45 - 160 VDC 176 - 264 VAC / 200 - 370 VDC AC Power supply frequency range is 47-63Hz Redundant power supply is optional
Power supply supervision contact	110VDC, 0.3A 220VDC, 0.1A
Power consumption	60W max.
Heat production	60W max.
Temperature	Operating: -30°C ~ +65°C (-22 °F ~ 149°F) (Maximum continuous CPU burden 50% of lowest/highest operating temperature) Storage: -40°C ~ +75°C (-40 °F ~167°F)
MTBF	25 years (+25°C / 77°F) 22 years (+40°C / 104°F)
Relative humidity	5% ~ 95% (+40°C / 104°F) non-condensing
Protection class	IP40

6.2 EMI/EMS and environmental standard compliance

The following tables list the EMI/EMS and environmental standard compliance.

Table 6.2: IEC 61850-3 standard compliance

Type test	Description	Severity level
IEC 61000-4-2-2001	Electrostatic Discharge	Level 4 -±8KV Contact/±15KV Air
IEC 61000-4-3-2006	Radiated RF Succeptibility	Level 3-18V/m, 6 directions
IEC 61000-4-4-2004	Fast Transient (Burst Immunity)	Level 4- ±4KV 5KHz
IEC 61000-4-5-2005	Surge Immunity	Level 4 ±4KV line-to-earth/±2KV line-to-line
IEC 61000-4-6-2006	Conducted RF Immunity	Level 3-10Vrms
IEC 61000-4-8-2001	Magnetic Field Immunity	Level 5- 100A/m 5min / 1000A/m 1s
IEC 61000-4-10-1993	Damped Magnetic Immunity	Level 4- 30A/m
IEC 61000-4-12-1995	Damped Oscillatory Burst	Level 3-2.5KV common/Differential 1.25KV for Substation
IEC 61000-4-16-2002	Conducted RF Immunity	Level 3-15Hz~150KHz
IEC 61000-4-29-2000	Voltage Dips and Interrupts	30% 120ms/ 70% 10ms 100% 3ms (cycle 3)
CISPR22-2008	Conducted and Radiated Emissions	Class A
FCC 15	Conducted and Radiated Emissions	Class A
EN55022A	Conducted and Radiated Emissions	Class A
IEC 60255-5	Insulation resistance measurement	500VDC, 1min, 999Mohm>100Mohm
IEC 60255-27	Protective bonding resistance	25Amps, 1min, 0.021ohm<0.1ohm

Table 6.3: IEEE Std 1613-2003 standard compliance

Type test	Description	Severity level
IEEE C37.90.1	EFT	Level 4- ±4KV 5KHz All ports
IEEE C37.90.3	ESD	Level 4 -±8KV Contact/±15KV Air
IEEE C37.90.1	Oscillatory Wave	Level 3-2.5KV common/Differential 1.25KV for Substation
IEEE C37.90	Dielectric Strength	2000Vrms
IEEE C37.90	Impulse Voltage	5000V
IEC 60870-2-1-1995	DC Voltage Ranges	-20%~+15%
IEC 60870-2-1-1995	Voltage Ripple of DC	Level VR3- ≤5%

Type test	Description	Severity level
IEEE C37.90	Nonoperational Temperature Range	-40°C~+75°C
IEEE C37.90	Operational Temperature Range	-30°C (Start Up)~+65°C

Table 6.4: Environmental standard compliance

Type test	Description	Severity level
IEC 60068-2-1	Cold Temperature	-30°C Start Up for 16 hours
IEC 60068-2-2	Dry Heat Temperature	+65°C Start Up for 16 hours
IEC 60068-2-30	Humidity (Damp heat, Cyclic)	Test Db 6 cycles +25°C/+55°C 93%/95% (1 cycle=24hrs)
IEC 60068-2-3	Humidity (Damp heat, Steady state)	95% (non-condensing) 40°C 2d
IEC 60870-2-2-1996	Vibration	10-200-500-200-10Hz (1g/1.5g) X/Y/Z axes
IEC 60870-2-2-1996	Shock	10g 11ms X/Y/X axes
IEC 60068-2-29-1987	Bump (Packed)	10g, repeat 1000 times X/Y/Z axes
IEC 60068-2-29-1987	Bump (Unpacked)	10g, repeat 1000 times X/Y/Z axes

7 Capacity and performance

7.1 SYS 600C capacity

This chapter gives an overview of the capacity of SYS 600C regarding the following functions or aspects:

- Number of IEDs that can be connected
- Usage of the following functions: workplaces and process displays, gateway, mirroring, HSB
- Data logging (for example, for measurement reports and trends) and event logging

Conditions:

- The capacity information is only applicable, when no additional software is installed and/or running in the computer.
- The average CPU load of the computer must not exceed 50%.

The system size capacity figures follow these principles:

- A guideline for the maximum process communication (Number of IEDs or Number of Messages/sec.) is given. This includes the process communication functions and the logging of data in the process database.
- If other functions are added, such as gateway or workplaces, they consume computer capacity and thereby the process communication capacity must be reduced accordingly. For IEC 61850 the capacity is mainly affecting the number of messages, and thus it is more important that this is reduced than the number of IEDs.
- The impact on the process communication capacity of the other functions is given in percentage.

Example: How many IEDs can be connected over IEC 61850 to SYS 600C that acts as a gateway with one NCC connection and one operator workplace?

- Maximum of 160 IEDs can be connected over IEC 61850 (with 12 msg/s/IED), see Table 7.1.
- The following functions are also needed:
    - One NCC connection (-25%)
    - 1 workplace (-5%)
    - The process communication capacity in this case is:
        - 5% * (95% * 160 IEDs) = 114 IEDs or
        - 75% * (95% * 1920) msg/s = 1368 msg/s

7.2 Data logging capacity

The data logging capacity concerns logging to disk and is limited by the available disk capacity. Roughly 10GB of dsk is allowcated for event logging and same amount for data logging.

This corresponds to:

- Number of events: 3 000 000
- Number of logged values: 90 000 000

The maximum number of logged values corresponds roughly to 400 measurements sampled every 15 minutes and stored for 1 + 5 years (current year + 5 years of history).

7.3 Process communication capacity

The capacity of one protocol means that only that protocol is used. If several protocols are combined, the maximum capacity per protocol must be reduced proportionally.

Example: IEC 61850 and LON are combined in the system. The IEC 61850 IEDs represent 60% of the maximum IEC 61850 capacity. Then the actual maximum LON capacity is 40% of the indicated maximum capacity.

The following tables show the maximum communication capacity for the most commonly used protocols.

Table 7.1: Maximum communication capacity

IEC 61850	**Value**	**Comments**
Nr of messages	1920/s	
Nr of IEDs	160	
Nr of IEC 61850 clients	4	
LON		
Nr of IEDs	90	Maximum 30 IEDs per XLON card
Nr of XLON cards	3	Limited by available PCI slots
IEC 103		
Nr of IEDs	200	
Nr of IEDs / line	15	Limited mostly by maximum response time
IEC 101		
Nr of IEDs	200	
Nr of IEDs / line	15	Limited mostly by maximum response time
IEC 104		
Nr of IEDs	200	If I/O count is small, number of IEDs can be bigger
Nr of IEDs / line	15	
SPA		
Nr of IEDs	200	
Nr of IEDs / line	15	Limited mostly by maximum response time
Modbus RTU		
Nr of IEDs	200	
Nr of IEDs / line	15	Limited mostly by maximum response time

Modbus TCP/IP		
Nr of IEDs	200	
Nr of IEDs / line	15	Limited mostly by maximum response time
DNP serial		
Nr of IEDs	200	
Nr of IEDs / line	15	Limited mostly by maximum response time
DNP LAN		
Nr of IEDs	200	If I/O count is small, number of IEDs can be bigger
Nr of IEDs / line	15	

Table 7.2: Impact on process communication

Function	Impact on process communication	Comments
Local process database	- 0%	Always included
Mirroring	- 2%	
Hot Stand-by redundancy	- 2%	
Gateway / NCC connections	- 25% - 0%	- 25% when total data update rate to all NCCs is 50% from the process data update rate
Process display Workplace	- 24% - 1%	- 24% when Process display with 1 050 measurement objects in Workplace - 18% when Process display with 1 050 switching device objects in Workplace - 4% when Process display with 150 measurement objects in Workplace - 2% when Process display with 150 switching device objects in Workplace
Trends Workplace with data logging	- 1%	Per Workplace with Trends with 10 curves on 30 seconds interval logging
Reports Workpace with data logging	- 1%	Per Workplace with Measurement Reports with 15 min report Total of 900 objects data logged by Measurement Reports

The following list shows some examples when IEDs are connected to SYS 600C with the following Gateway or NCC connections and with Local process database:

- NCC connection with one DNP LAN communication including 84 IEDs resulting in 1 000 process updates per second sent to one NCC*)
- NCC connection with two DNP LAN communications including 67 IEDs resulting in 1 600 process updates per second sent to two NCCs*)
- NCC connection with one IEC 104 LAN communication including 158 IEDs resulting in 1 900 process updates per second sent to one NCC
- NCC connection with two IEC 104 LAN communications including 116 IEDs resulting in 2 800 process updates per second sent to two NCCs

*) 90% 16-bit analog data without time, 5% binary data without time and 5% binary data with time

The following list shows some examples when IEDs are connected to SYS 600C with Local process database and displayed with Workplaces:

- 60 IEDs with IEC 61850 protocol and 1 Workplace with 1 050 display objects
- 63 IEDs with IEC 61850 protocol and 2 Workplaces both including 450 display objects
- 77 IEDs with IEC 61850 protocol and 1 Workplace including 150 display objects

8 Abbreviations

Abbreviation	Description
BIOS	Basic Input/Output System
DCS	Distributed Control System
EMI	Electromagnetic Interference
EMS	Electromagnetic Shielding
HSI	Human System Interface
IED	Intelligent Electronic Device
IP	Internet Protocol
LAN	Local Area Network
LED	Light Emitting Diode
MTBF	Mean Time Between Failure
NCC	Network Control Center
OPC	OLE for Process Control
PLC	Programmable Logic Controller
RTU	Remote Terminal Unit
SNMP	Simple Network Management Protocol
SNTP	Simple Network Time Protocol
SSD	Solid State Drive
SYS 600	Product name
SYS 600C	Product name
USB	Universal Serial Bus
VGA	Video Graphics Array
VPN	Virtual Private Network

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