

Product guide

COM600F

Distribution automation controller

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This product complies with the directive of the Council of the European Communities on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive 2004/108/EC) and concerning electrical equipment for use within specified voltage limits (Low-voltage directive 2006/95/EC). This conformity is the result of tests conducted by ABB in accordance with the product standards EN 50263 and EN 60255-26 for the EMC directive, and with the product standards EN 60255-1 and EN 60255-27 for the low voltage directive. The product is designed in accordance with the international standards of the IEC 60255 series.

1. General description

ABB's COM600F offers a versatile substation management solution. These units are deployed together with protection and control relays and other communication devices to implement smart substation and grid automation solutions in utility and industrial distribution networks. The COM600 series performs the combined role of a user interface, communication gateway and an automation platform in a single physical device.

The COM600F incorporates web technology for substation devices and processes via a web browser based human machine interface (HMI). All standard substation monitoring and control aspects can be handled using the Web HMI.

The COM600F integrates substation devices like protection and control relays, substation controllers and meters based on the IEC 61850 communication standard, other legacy and de-facto protocols on the substation network. A seamless connectivity can be established with a gateway functionality between the substation devices and external higher-level systems such as Network Control Centre (NCC) or a process such as Distributed Control System (DCS) using IEC 60870-5, DNP3, Modbus or OPC-based protocols.

The COM600F comprises of an application environment that facilitates the development of customized substation automation tasks based on the IEC 61131-3 standard.

The COM600F hardware platform is based on ruggedized mechanics with no moving parts subject to wear and tear. The compact and robust design is well adapted for harsh environments.

A faster project execution is enabled by a preinstalled software and an off-line configuration performed on a separate computer.

Distribution automation controller solutions

COM600F is a vital component in medium voltage substation automation solutions that can comprise of components such as Relion 610, 611, 615, 620, 630 series, RIO600 Remote I/O series and third party relays, based on IEC 61850 and other open protocols. Besides functions and applications realized using single or multiple protection and control relays, advanced/value added functions or applications can also be realized in the COM600F unit by using the process data from the protection and control relays and its own inherent features. In this manner, more processed information can be made available to higher-level systems such as NCC or DCS, thus creating smarter substations.

An integrated approach using a combination of the Relion 610, 611, 615, 620, 630 series, RIO600 and COM600F in medium voltage switchgear or dedicated cabinets is categorized under Distribution automation controller solutions.

Such solutions are envisaged in industries, infrastructure or electric utility based projects. Some examples are categorized as below:

- With legacy protection and control installations in primary distribution substations
- A mix of brownfield and greenfield installations based on IEC 61850 in primary distribution substations
- In greenfield or brownfield secondary distribution substations
- In combination with Compact Power Management
- load-shedding solution, (cPMS from ABB), especially for small or medium sized industries or infrastructure installations
- Above solutions could involve running functions or applications in the COM600 series involving multiple feeders' data acquired from their respective protection and control relays
- In grid automation applications, looking in an 'outward' direction from the substation

Each of the application scenarios mentioned above can involve multiple feeders whose data is acquired from their respective protection and control relays to COM600F.

The COM600 series comprises of two variants, based on the primary intent or application:

- Substation Automation
 - COM600 is a substation automation and data management device that integrates devices, facilitates operations and manages communications in utility or industrial distribution substations
- Feeder Automation (ANSI/US markets only)
 - COM600F is a feeder automation and data management device that runs distributed grid applications in ANSI standard based utility power networks

IEC 61850 based substation communication is the very basis for applications that need a cluster approach involving protection and control relays, meters, controllers, etc. COM600 will be enabled with IEC 61850 communication capabilities by default to facilitate this aspect. There are also many new features, described later in the document, that have been introduced in the COM600 series engineering and configuration process to achieve better efficiency.

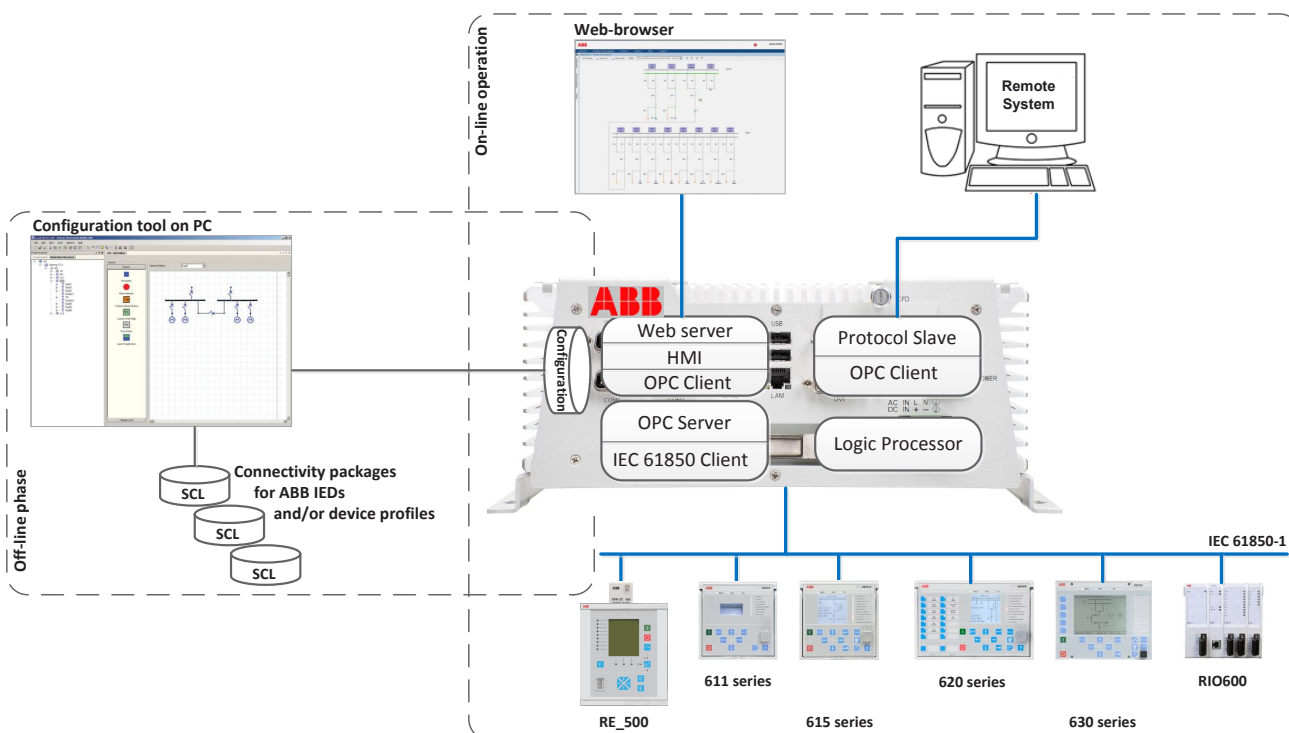


Figure 1. COM600 series overview

2. Application

The COM600F has the capability to function as a combined substation HMI, gateway and process controller in a small to medium sized substation automation installation. Its HMI feature enables substation monitoring and operations. It integrates various protection and control relay units based on standard and de-facto protocols and provides access to real-time data. It also records process data in its historian to enable access to past data. Its logic processor enables implementation of substation-level automation tasks. The gateway functionality provides a provision to communicate data from protection and control protection and control relays in the substation and COM600 series itself to higher-level systems and vice versa.

The envisaged substation installation could comprise of the following components/aspects:

- A medium voltage network in an industrial or utility installation
- 30 to 80 feeders with typically one protection and control relay associated with every feeder
- Protection and control infrastructure comprising of Relion 630, 620, 615 and 611 series protection and control relays, Remote IO RIO600 or 3rd party protection and control relays enabled with IEC 61850 communication capabilities

- Protection and control infrastructure comprising of Relion series, legacy protection and control relays, or 3rd party protection and control relays enabled with legacy protocols such as IEC 60870-5-103, DNP 3.0, Modbus
- Other communicable units such as meters, substation or process controllers on any of the standard protocols mentioned above
- Data communication based on Ethernet or RS232/485 physical standards
- Redundant or non-redundant communication infrastructure based on IEC 61850 (IEC 62439 PRP/HSR)
- Installation based on ABB or 3rd party switchgear
- Connectivity to higher level systems: substation automation units such as MicroSCADA, process DCS such as System 800xA, control centre systems such as DMS600 etc. using standard protocols such as IEC 60870-5-101/104, DNP 3.0, Modbus, OPC

Note: For simplicity's sake, connectivity from COM600F, using Ethernet based protocols, towards NCC, DCS etc. is shown directly from the unit. Actually, this connectivity will also be through the appropriate substation switch.

Such an installation sets operational expectations from the COM600F substation level component, such as:

- Substation monitoring and control:
 - Electrical process and feeder level single line diagram
 - Switch (circuit breaker and disconnector) control
 - Alarm and Events
 - Trends and Reports
- Communication gateway
- Process control applications development
- Migration of legacy devices' information to IEC 61850, especially in a system augmentation case where the existing protection and control relay infrastructure needs to co-exist with new ones
- Special tools to monitor IEC 61850 network

It benefits from the potential of the IEC 61850 standard by using the IEC 61850-6 substation configuration language (SCL) and IEC 61850-7 data communications modeling regardless of protocol used. As the IEC 61850 data modeling is used for all communication protocols, the gateway functionality data cross-referencing is done in a similar manner irrespective of the protocol used.

To facilitate the above, the COM600F has a range of rich features that are briefly described in the following sections.

3. Process visualization

COM600F includes a web-browser-based user interface (Web HMI). This feature is enabled as default and it is used for efficient substation process visualization, monitoring and control.

The substation single-line diagram (SLD) content is displayed on one screen. The SLD recognizes different voltage levels and busbar systems such as single busbar, double busbar and duplex systems. The four-mode busbar coloring visualizes the busbar status and is user-configurable.

COM600F supports customized SLD views for substation, voltage level and bay objects. It has a substation level view, detailed bay views based on a zoom and panning facility. Three levels of display representations are possible: Master View, Substation View and Bay View with definitions of what is needed to be visible and controllable at each of the mentioned views. The Bay View can be accessed from the Master/Substation Views or from the substation hierarchical structure.

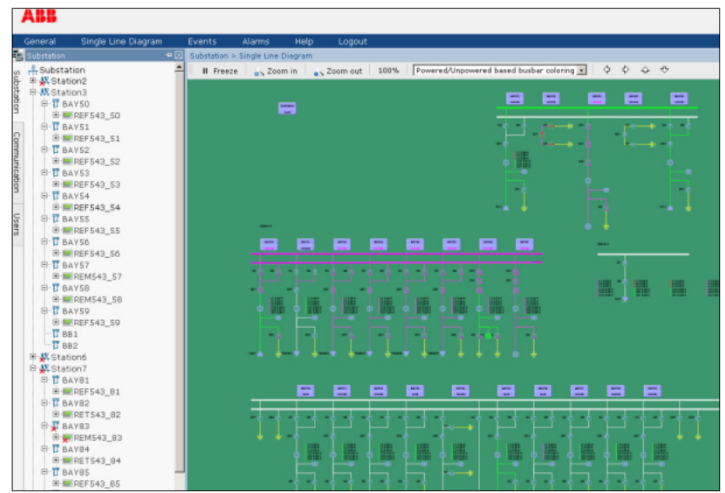


Figure 2. Web HMI: SLD view

The SLD can be configured to include an indication for the local/remote selection switch. Alarm symbols and generic symbols can be placed in the SLD to give an even better overview of the status. In addition, generic control buttons can be added to control objects. A separate control dialog is used for controlling the switching device. It provides information on switching device identification, reservation status and interlocking conditions. The select-before-execute logic is used to prevent unintended operation. By reserving the switching device for a single user, the risk of controlling the device from two different locations is eliminated.

COM600F supports the multiple-level control of a circuit breaker or a disconnector, as per IEC 61850 Edition 2.

This feature requires Mozilla Firefox®, Opera, Google Chrome or Microsoft Internet Explorer (IE) with Adobe SVG viewer 3.03. If IE 9.0 or later is in use, Adobe SVG viewer is not needed.

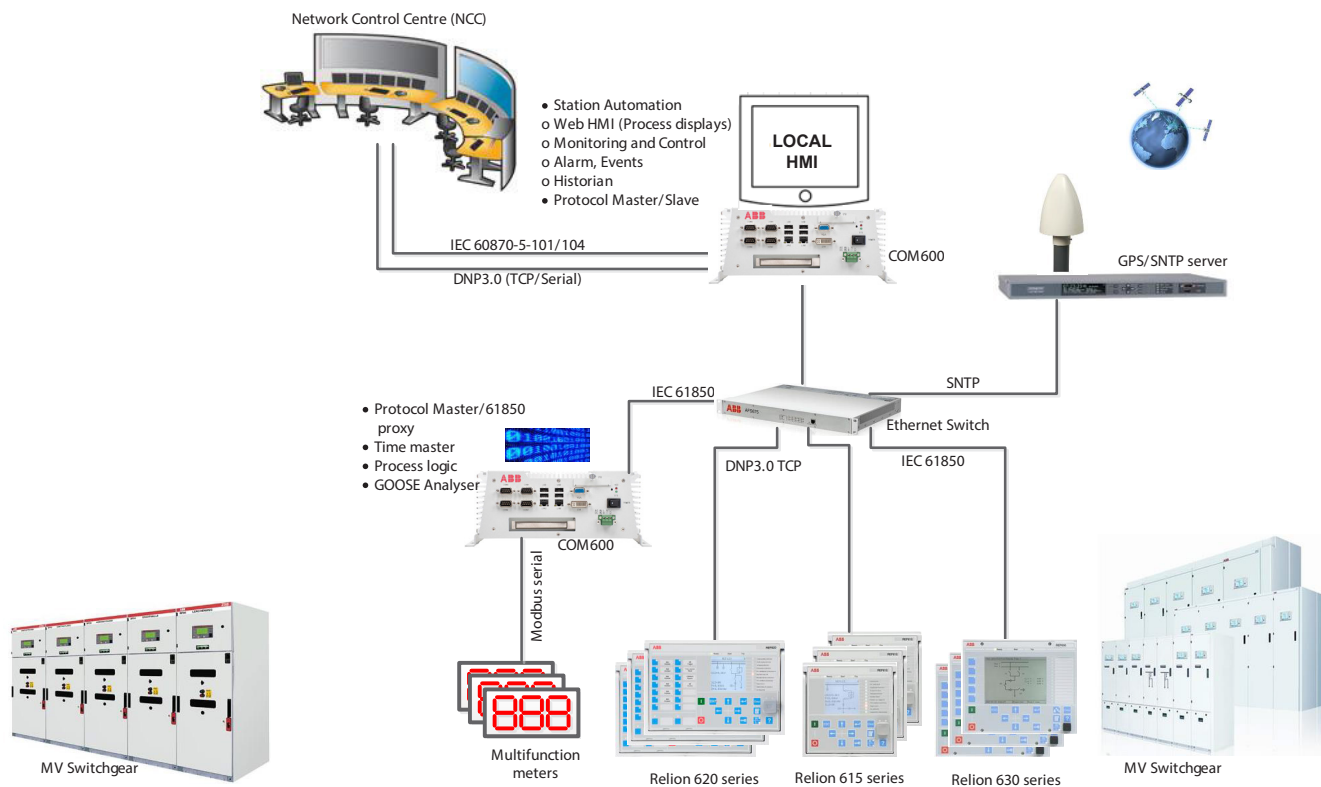


Figure 3. Example of distribution automation controller in brownfield and greenfield equipment based utility substation

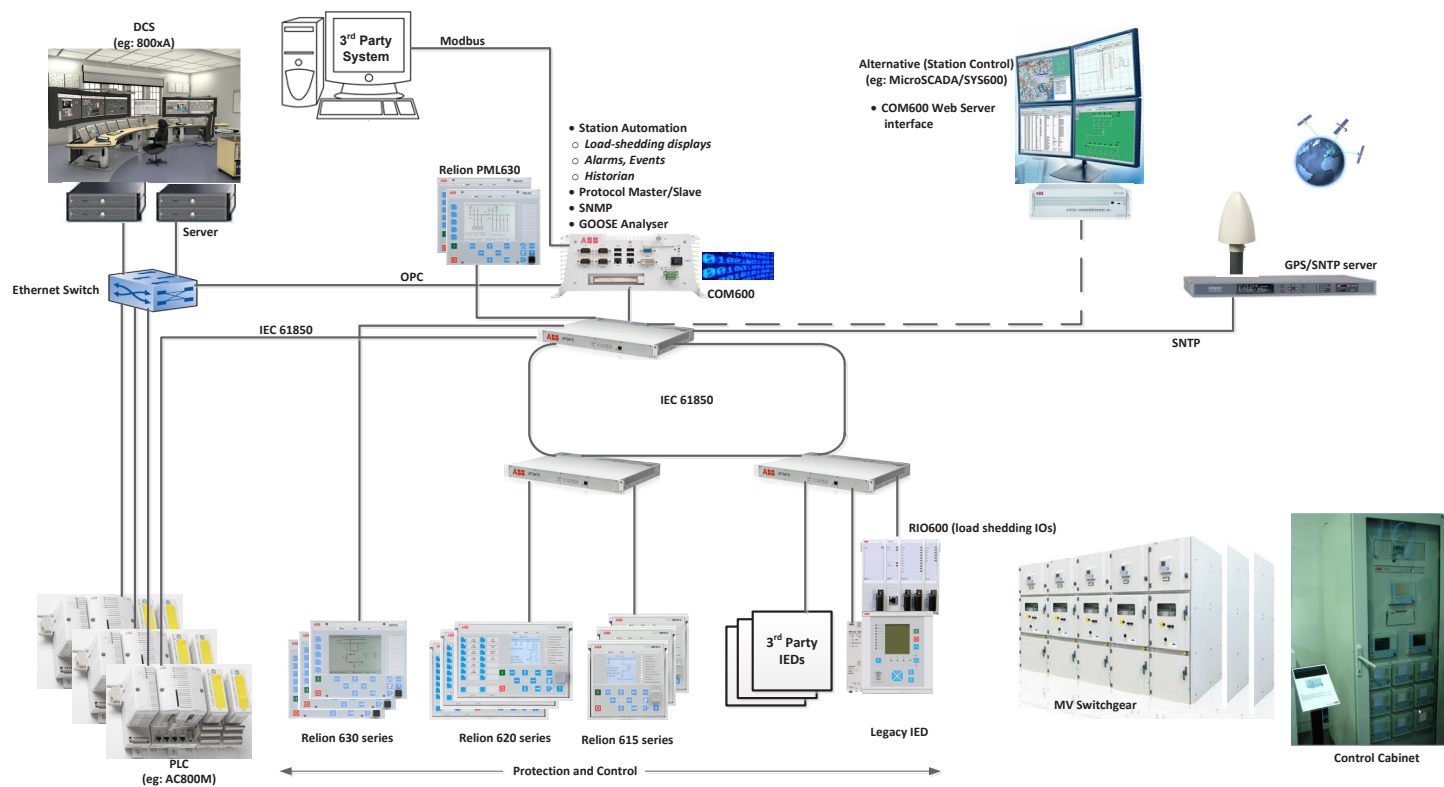


Figure 4. Example of combined distribution automation controller and cPMS for industrial substations

4. Modular OPC approach

The product architecture of the COM600F follows a modular approach using OPC.

This architecture facilitates addition of new product features that makes the COM600 series versatile.

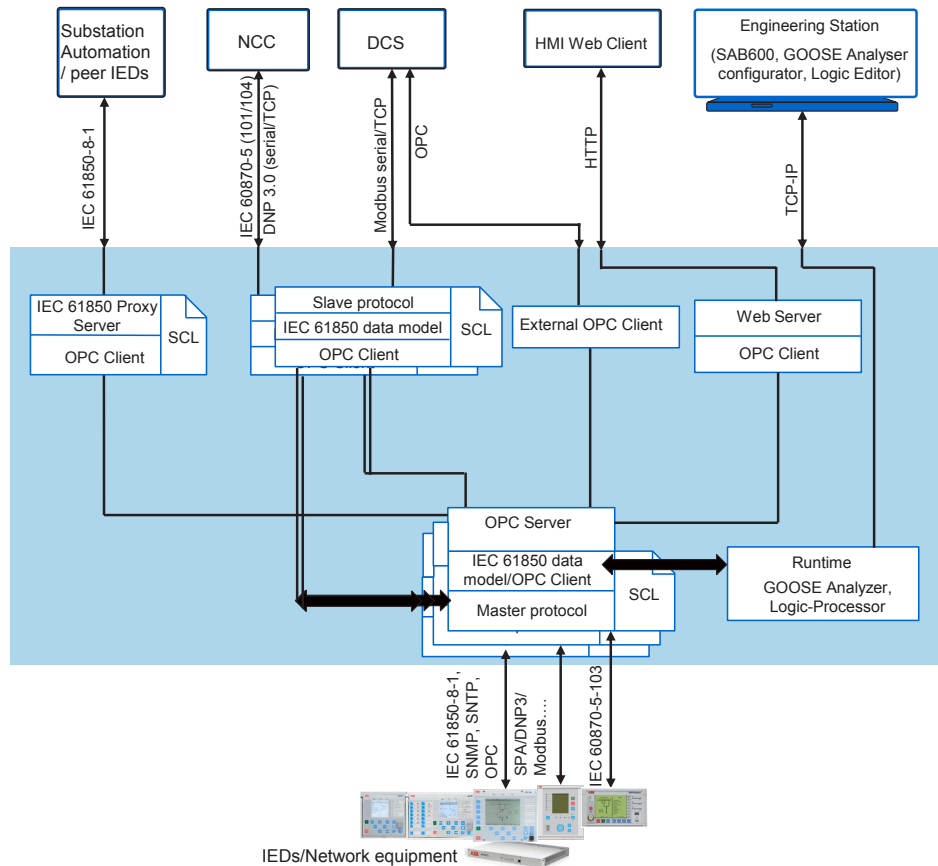


Figure 5. Modular OPC architecture

5. Ease of handling and improved usability

The improved SCL Import feature for IEC 61850 communication ensures an efficient handling of imported SCL data and COM600 series configuration in SAB600.

This improvement is featured especially in the following:

- importing standard or user-defined templates for alarm/event handling
- parameter filtering tool configuration
- protection and control relay SLD configuration
- protection and control relay summary tables

It is also possible to create reports using standard or user-defined templates in the COM600F HMI Client machine that also runs the Vtrin Client. MS-Excel (2010 and lower) 32 bit installation is a pre-requisite for the presentation of the reports.

IEDType	OrderCod	prefix	LNClas	InIns	CDC	CDCName	IndicationInde	PositionInde	GeneralInde
Generic	Generic		LLNO		INS	Beh	Not Defined		
Generic	Generic		LLNO		SPS	SetSeld	Not Defined		
Generic	Generic		LLNO		SPS	SetChg	Not Defined		
Generic	Generic		LLNO		INC	ActSG	Not Defined		
Generic	Generic		LLNO		SPS	Loc	Not Defined		
Generic	Generic		LLNO		INS	LocRem	Not Defined		
Generic	Generic		LPHD	1	INS	PhyHealth	Not Defined		
Generic	Generic		LPHD	1	INS	PhyHealth1	Not Defined		
Generic	Generic		LPHD	1	INS	PhyHealth2	Not Defined		
Generic	Generic		LPHD	1	SPS	PwrUp	Not Defined		
Generic	Generic		LPHD	1	SPS	PwrDn	Not Defined		
Generic	Generic		LPHD	1	SPS	PwrDn1	Not Defined		
Generic	Generic		LPHD	1	SPS	OutOv	Not Defined		
Generic	Generic		LPHD	1	SPS	OutOv1	Not Defined		
Generic	Generic		LPHD	1	INC	ChgFlg	Not Defined		
Generic	Generic		LPHD	1	SPC	FacSet	Not Defined		
Generic	Generic	DIAG	LCCH	1	SPS	ChLiv	Not Defined		
Generic	Generic	DIAG	LCCH	1	SPS	RedChLiv	Not Defined		
Generic	Generic	CCB	RBRF	1	ACD	Str			Not Defined
Generic	Generic	CCB	RBRF	1	ACT	OpEx			Not Defined
Generic	Generic	CCB	RBRF	1	ACT	Opln			Not Defined
Generic	Generic	LED	PTRC	1	ACT	Op			Not Defined
Generic	Generic	TRP	PTRC	1	ACT	Op			Not Defined

Figure 6. Uplink Address Table

A cross-reference tool is now available for automatically configuring data point addresses, when COM600F is an IEC 60870-5 or DNP3.0 or Modbus slave to a higher-level system. The user can select the necessary data objects from the communication tree structure in SAB600 and create a project-specific template.

Standard or default templates can also be used. The data point addresses are automatically assigned based on Logical Node classes and groups, downstream protection and control relay index (derived from its IP address).

COM600F can be configured and commissioned without a local keyboard and monitor connection. Using the Microsoft® Remote Desktop Protocol (RDP) connectivity, an external computer can be connected to the delivered COM600F on the same network.

The event list entries can be backed up and stored locally in

the operational mode of the COM600F local computer. Alternatively, an event list backup can be scheduled as a background process.

The security events and Data Historian entries can also be backed up manually or automatically in the same way.

A summary table provides an overview of the selected online data from a single or multiple protection and control relays. It can be accessed underneath the corresponding protection and control relay object or underneath the substation object. The table can be spread across multiple pages.

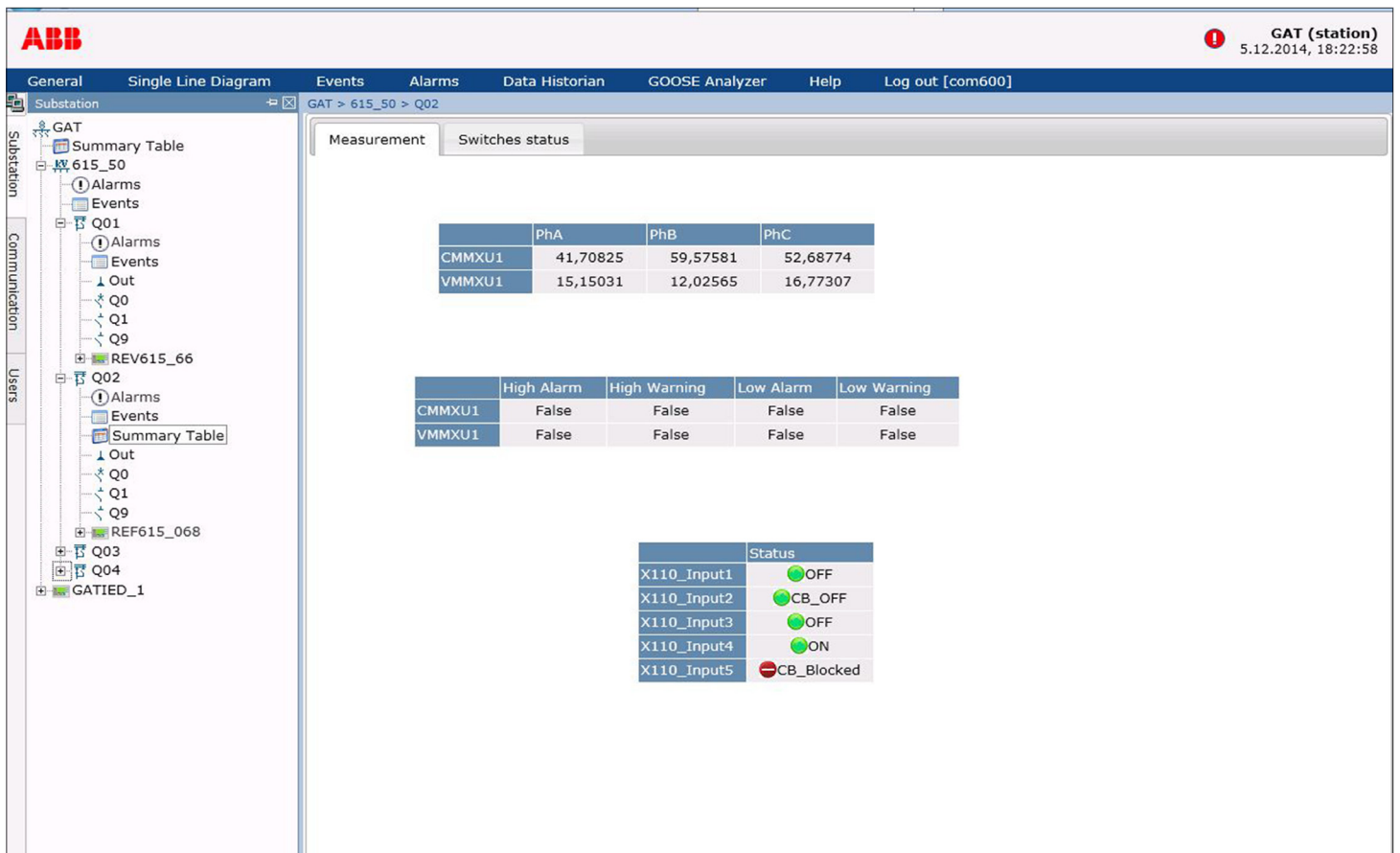


Figure 7. Summary table

6. Parameter setting

The parameter setting tool (PST) is used for viewing and/or setting parameters in protection and control relays supporting IEC 61850 parameterization. The PST enables the activation of the parameter setting function for the selected protection and control relay. It incorporates a feature that displays only the selected parameters on the COM600F web HMI, thereby limiting the number of visible parameters considered important for substation operation.

Changes in the settings require engineering or administrator rights in COM600F.

7. Event and alarm lists

Process Alarm and Event list together with audible alarm management is supported. These alarms and events are identified by date, time, bay, device, object description and status. Furthermore, the events and alarms can be automatically filtered according to voltage level or bay criteria. By default, 50 MB of disk space is reserved for storing the events. The storage enables the recording of up to ca. 500,000 events. The amount of disk space reserved for the events can be configured by the user. First-in, first-out logic is used for overwriting events. The user can export an event list to a .csv file for further analysis. COM600F also supports printing of events to an event printer.

8. Disturbance and fault record handling

COM600 series automatically uploads disturbance records from the connected protection and control relays. The disturbance records are saved in the standard COMTRADE format. An in-depth analysis is enabled using the WaveWin ABB software disturbance record analyzer supporting the COMTRADE format. The automatic upload of disturbance records uses the IEC 61850 file transfer services or File Transfer Protocol (FTP). The files can be transferred from the COM600F to an external computer using FTP.

COM600F includes an optional HMI functionality that supports the viewing of fault records from the 611, 615 and 620 series protection and control relays.

The records enable the user to analyze recent power system events.

Each record includes current, voltage and angle values, etc. The fault records are marked with consecutive fault numbers and time stamps that indicate when the faults were detected.

9. Data Historian

The COM600F Data Historian is a real-time database designed and optimized for process information management and extensive history recording.

The Data Historian is based on ABB's cpmPlus Knowledge Manager software. It combines the benefits of an easy-to-use real-time database with industrial reliability, performance, and real-time functionality to provide an excellent platform for process information management. The Data Historian can be used for accurate process performance monitoring by following process and equipment performance calculations with real-time and history values. Better understanding of the process behaviour by joining time-based process measurements with production and maintenance events helps the user to understand the process dynamics. It further provides required information for learning how to keep the process running. High performance and reliability, together with maintenance-free operation, provide a solid platform for trending. The optional Data Historian functionality offers means of storing, analyzing and presenting process data. A data export tool allows retrieval of data in .csv format for analysis in Excel.

Figure 8. Alarm list showing persisting and fleeting alarms

Selected	Date	Time	Bay	Device	Object Text	State	Status	Quality
<input type="checkbox"/>	28-11-14	13:37:58.020	Q01		SN1 Load shed operated	Active	Active	
<input type="checkbox"/>	28-11-14	13:37:58.020	Q01		Trip command to P15 OG32	Active	Active	
<input type="checkbox"/>	28-11-14	13:37:58.020	Q01		Trip command to P08 OG21	Active	Active	
<input type="checkbox"/>	28-11-14	13:37:58.020	Q01	G21	P02 G21 CB Position	Open	Active	
<input type="checkbox"/>	28-11-14	13:37:58.015	P02		P02 G21 CB Position	Open	Active	
<input type="checkbox"/>	28-11-14	13:21:27.094	P15		P15 MF31 CB Position	Closed	Acknowledged	
<input type="checkbox"/>	28-11-14	13:21:19.457	P04		P04 IT22 CB Position	Closed	Acknowledged	

Selected	Date	Time	Bay	Device	Object Text	State	Status	Quality
<input type="checkbox"/>	28-11-14	13:39:26.563	P10	P10_MF25		Device Connection Lost	Inactive	

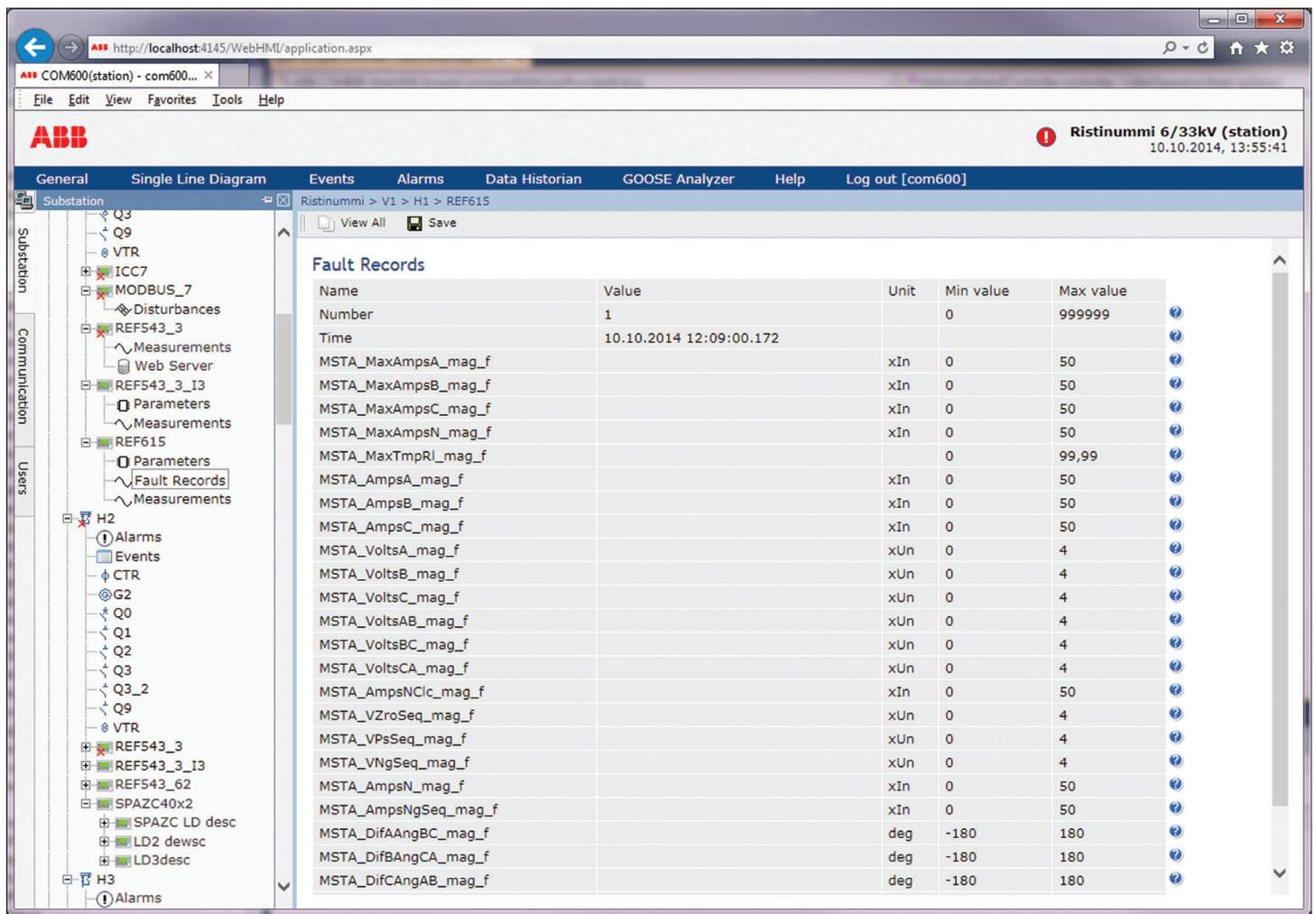


Figure 9. Disturbance Record information access for ABB protection and control relays

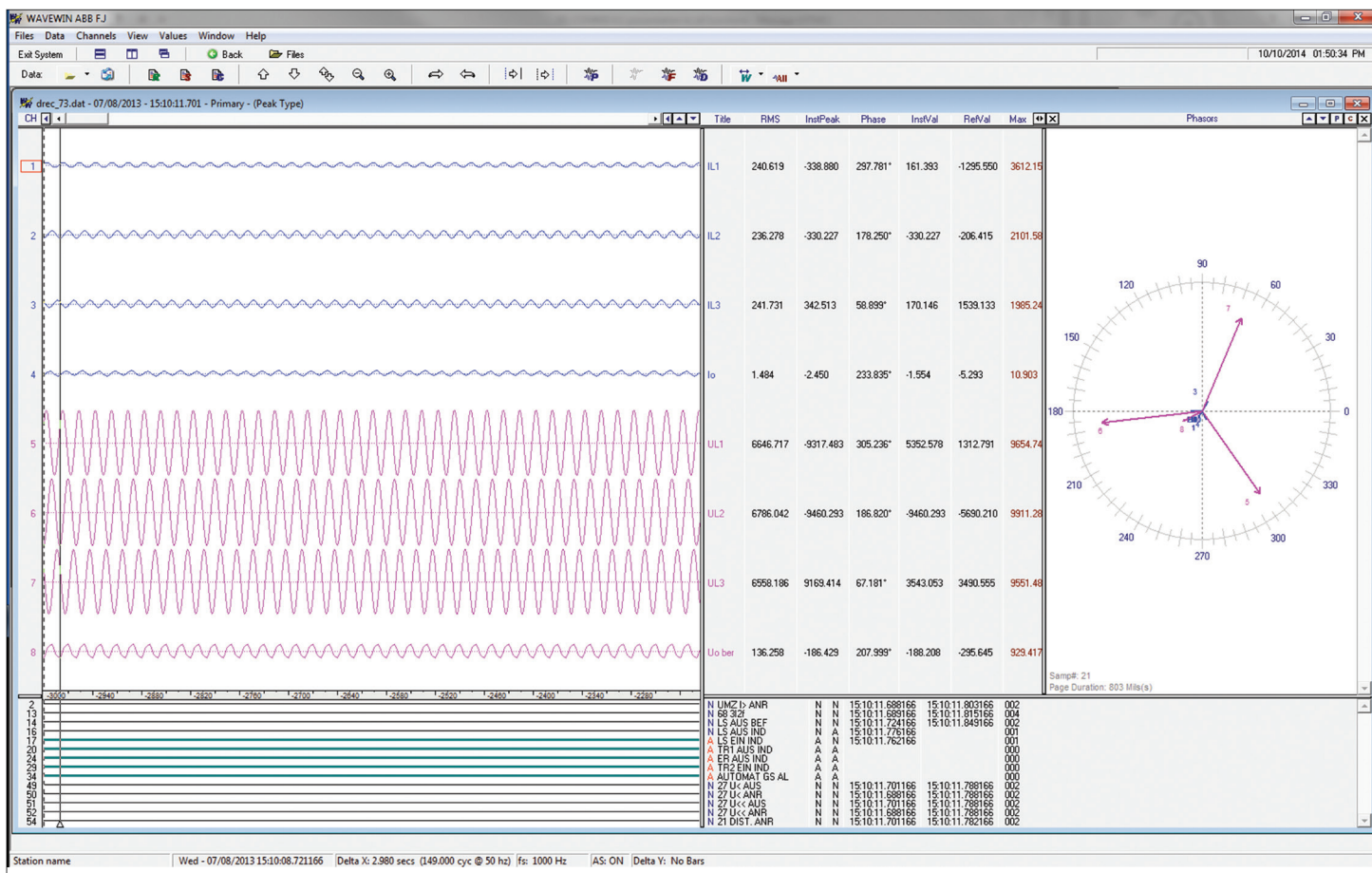


Figure 10. WaveWin Viewer

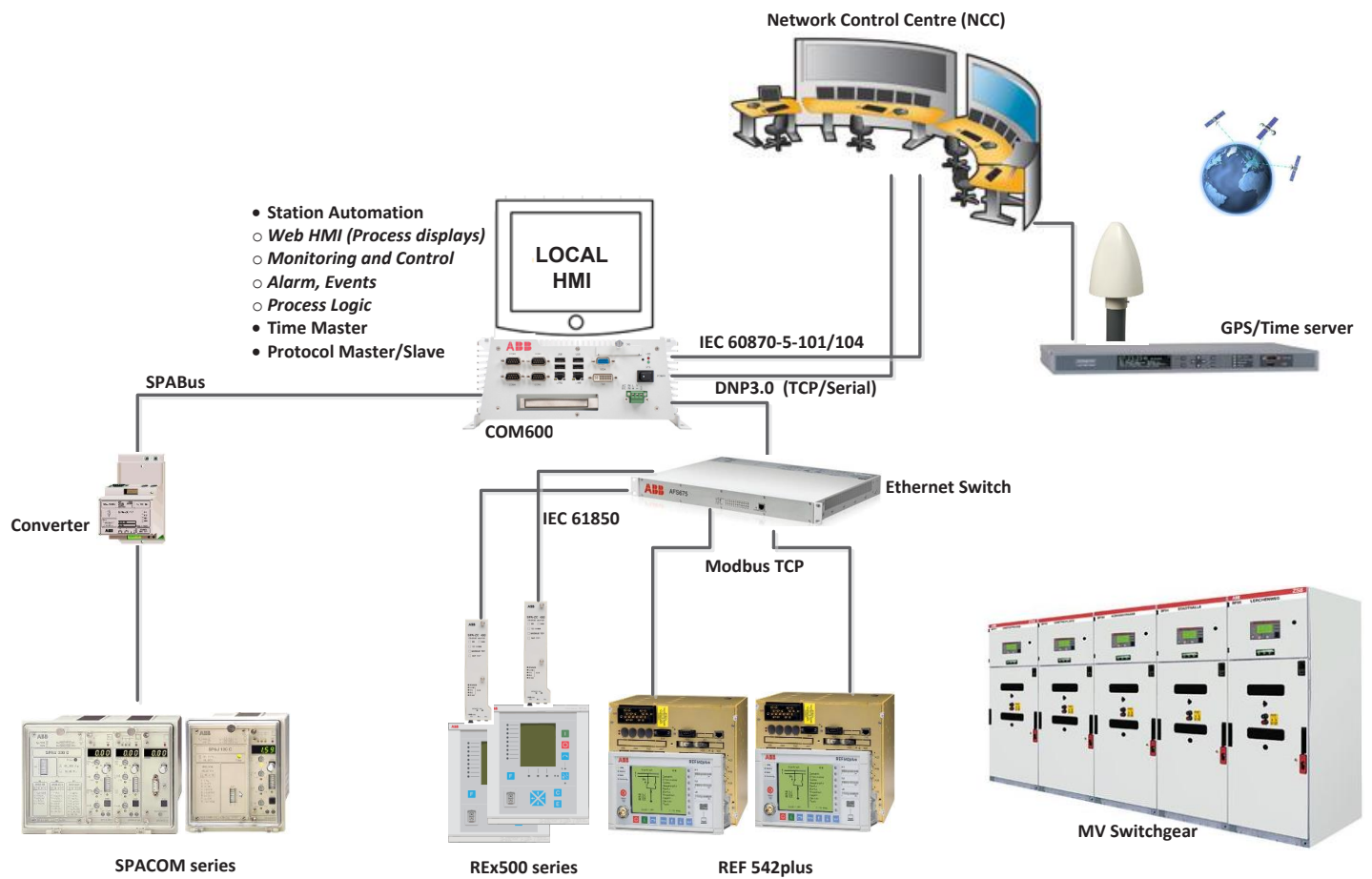


Figure 11. Distribution automation controller for substation with legacy protection and control relays

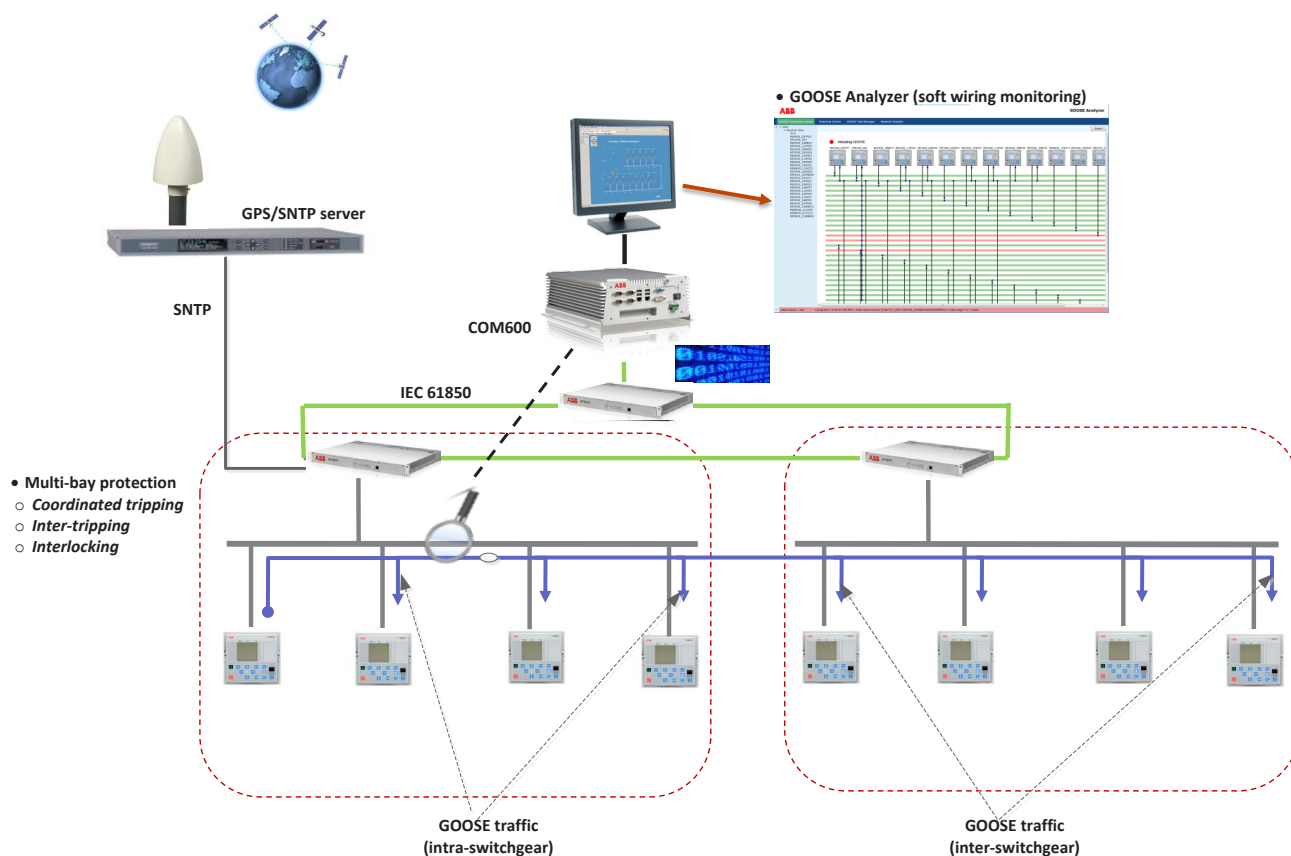


Figure 12. COM600F GOOSE Analyzer for soft-wiring monitoring

10. Soft-wiring monitoring with GOOSE Analyzer

The COM600F GOOSE Analyzer (GA) is a professional system-level tool for monitoring and analyzing GOOSE signals exchanged between protection and control relays over IEC 61850-8-1 substation bus. The analysis of GOOSE signals is based on a System Configuration Description file (SCD). This feature can be made use of during commissioning, operation, maintenance and upgrade phases of the system.

GA consists of a server and a user interface that is integrated with Process Visualization Web HMI. The server incorporates GOOSE Connection Viewer and the GOOSE Test Manager functionality.

The GOOSE Connection Viewer presents graphically the GOOSE signal flow from the publisher to subscriber protection and control relays on a content page. The Connection Viewer enables real-time diagnosis of the GOOSE signal flow presenting the status of communication between devices such as Relion series protection and control relays, Remote I/O RIO600, COM600F itself, other ABB IEC 61850 systems and 3rd party IEC 61850 protection and control relays.

Further, the Viewer provides fast and reliable approach to establish a holistic view of all network devices utilizing GOOSE and the status of the communication links between them. It also provides a continuous list of latest sent values and real-time events. Query of historical events is also supported.

GA displays the diagnostic events on the COM600F Web HMI events list, together with other process events. A dedicated view of the diagnostic is also available under the GOOSE Connection Viewer/GOOSE Diagnostic Events tab. In this manner, the GA-generated alarms and events can be recorded even when the substation is unmanned or when the GA window is not open.

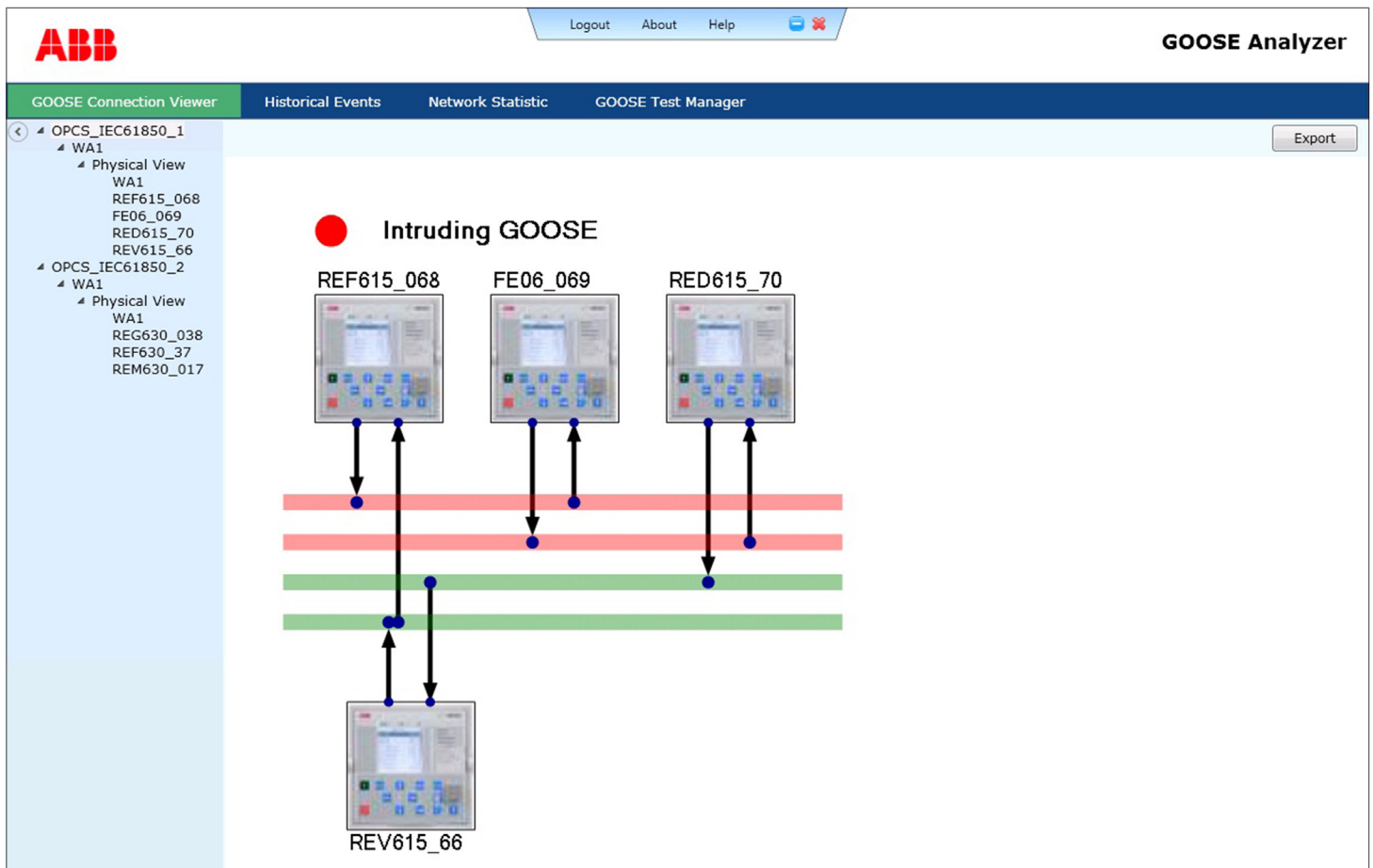


Figure 13. GOOSE Connection Viewer

11. Logic Processor

COM600F facilitates the creation and execution of specialized substation automation logic or applications using real time data acquired from connected substation devices, or external systems and activate control actions.

It is also possible to use historical data to execute logic with the help of the Logic Processor feature. This feature supports all five Programmable Logic Controller (PLC) languages specified by IEC 61131-3 standard and is offered as an optional feature.

The Logic Processor has on-line and off-line features for engineering and diagnostics. The result of the application logic can be displayed in the HMI and sent as a command to a protection and control relay or as processed information to an external system, such as an NCC or DCS.

A framework for sequence control application is also available within the Logic Processor. This framework includes HMI functions for controlling and monitoring the sequence execution, and a logic processor library for creating the sequence logic. With the help of sequences the operator can run control sequences to operate multiple switching devices, e.g. circuit breakers, sequentially to a certain state. It is recommended to ensure an optimal usage of the Logic Processor with the overall COM600F run time performance in mind.

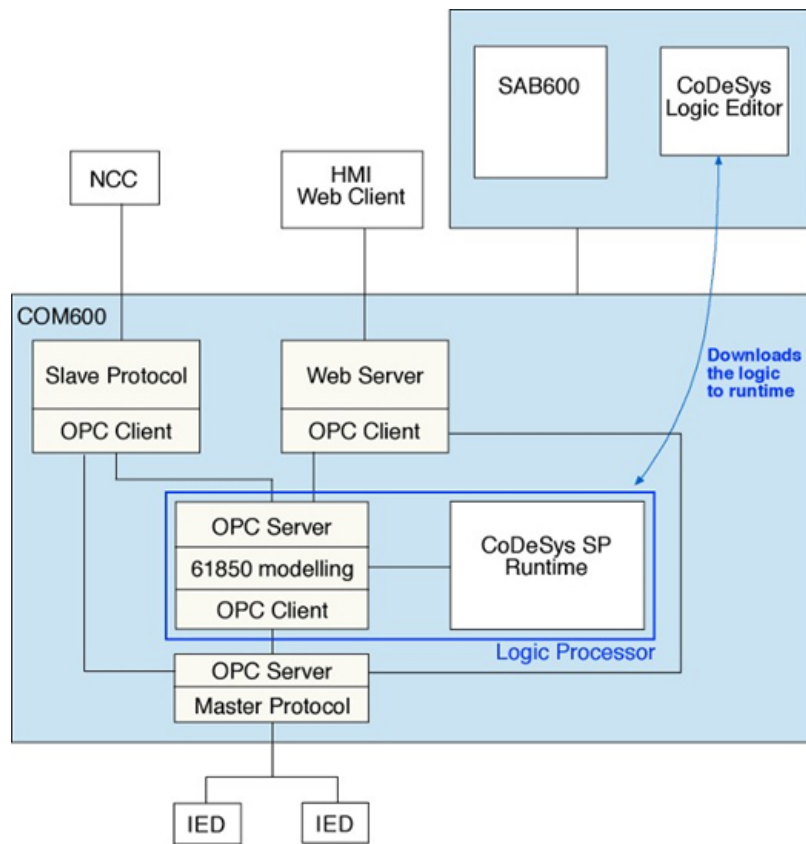
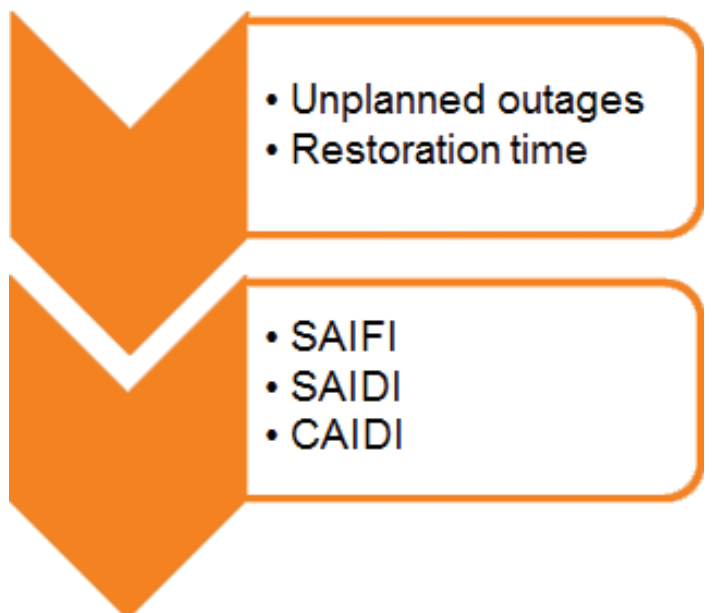


Figure 14. Logic Processor

12. COM600F Logic Processor Algorithm

The COM600F offers an optional pre-defined algorithm unique to the ANSI market

- Fault Detection Isolation and Restoration (FDIR)
- FDIR enables the utility to quickly identify the fault location, isolate it, and restore power during an unplanned outage by rerouting the flow of power on the distribution grid through unaffected areas. Benefits include:
 - Improved customer service
 - Increased revenues
 - Lower operations cost
 - Reduced risk of fines and lawsuits.
 - Improve CAIDI and SAIDI metrics by up to 33%
 - Decrease restoration time to less than 30 seconds*
 - Reduce the cost of restoration
 - Prevent lost revenues
 - Boost the utility's reputation with customers, stockholders and regulators
 - Automated logic generation. No PLC programming required



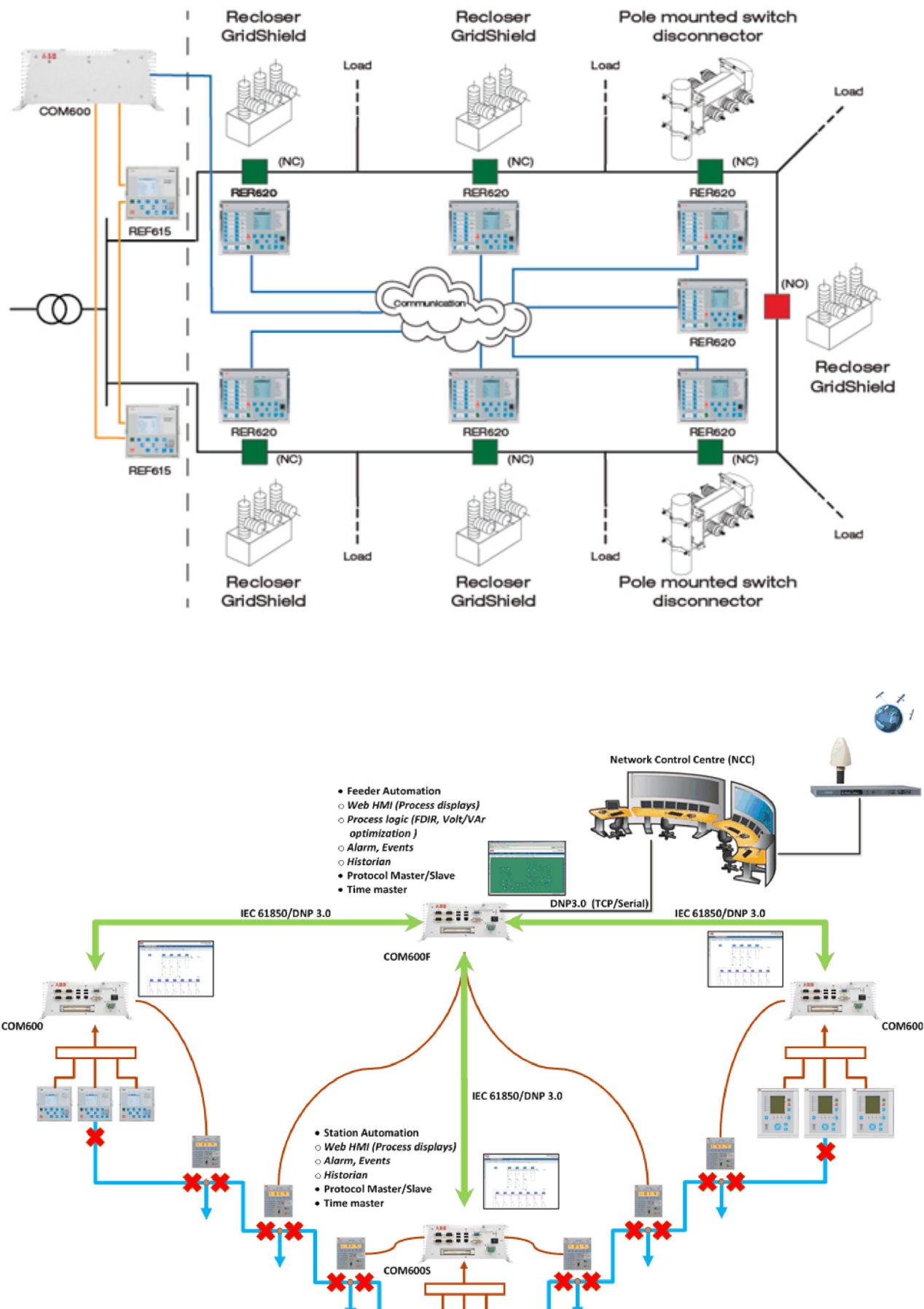


Figure 15. FDIR

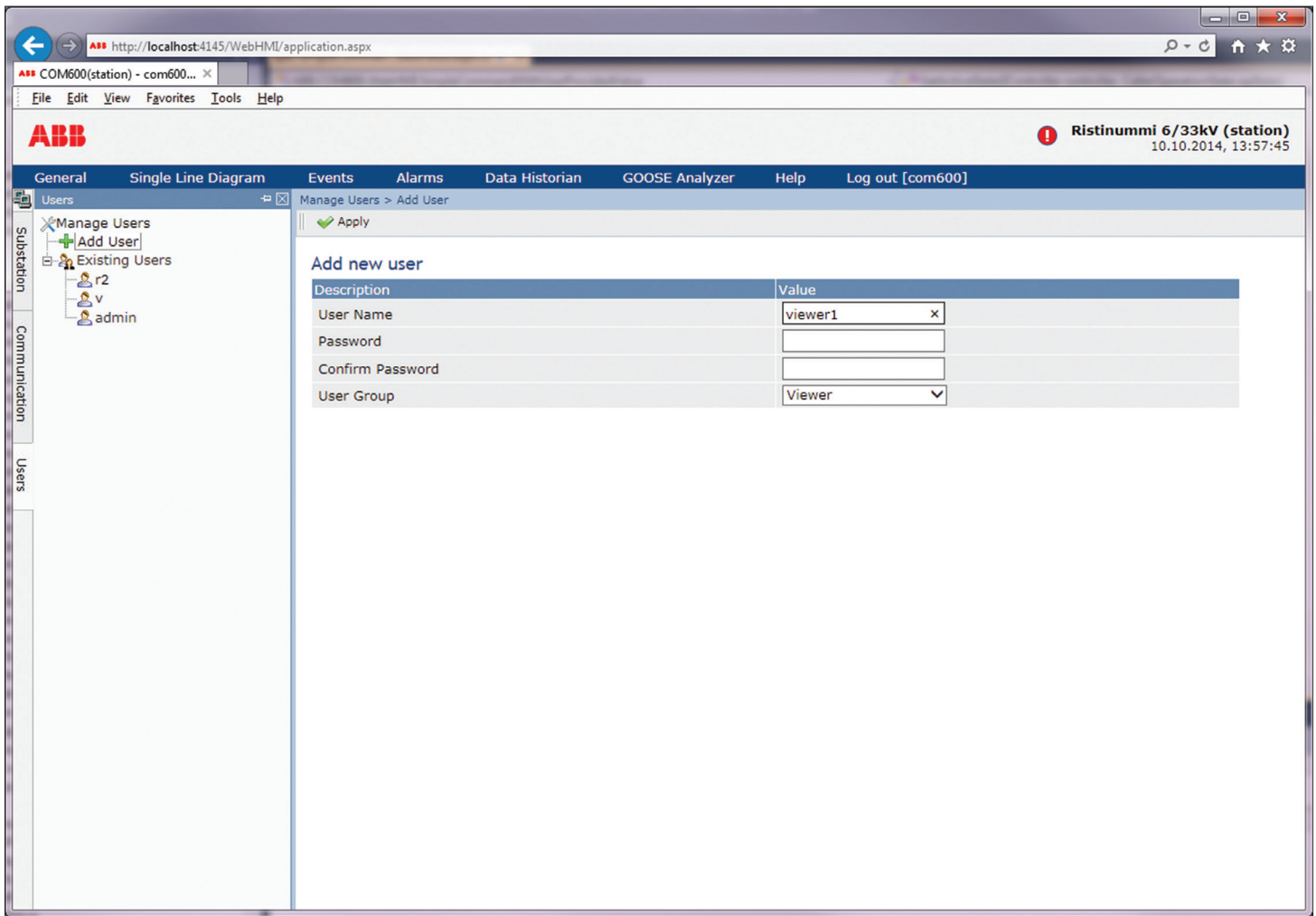


Figure 16. User access in COM600F

13. Access control and substation security

To protect the COM600F from unauthorized access and to maintain information integrity, COM600F is provided with a four-level, role-based authentication system with administrator-programmable individual passwords for viewer, operator, engineer and administrator level. Further, the security features include host-based firewalls and communication encryption using the secure HTTPS (HyperText Transfer Protocol Secure) protocol.

Extensive operational security aspects have been included in the COM600F.

This includes the following:

- Generating and storing security events caused by user activity and other software operations
- Capturing and storing security alarms/events in protection and control relays connected to COM600F and forwarding them, with the help of the gateway features, to a higher level systems like NCC, DCS or any external subscriber

A dedicated OPC server called Security Event (SEV) OPC server

is included to generate security events on a real time basis. The security events in the SEV OPC server are modeled according to IEC 61850. The security alarms and events can be forwarded using IEC 60870-5-101,104, DNP3.0 (serial/TCP) or Modbus (serial/TCP).

The security alarms and events published in Syslog messaging format by the SEV OPC server, are sent to the Centralized Account Logging (CAL) server that performs a centralized log collection, session management and user authentication.

The CAL server presents logged events, Syslog messages etc. also in the process alarm or event lists.

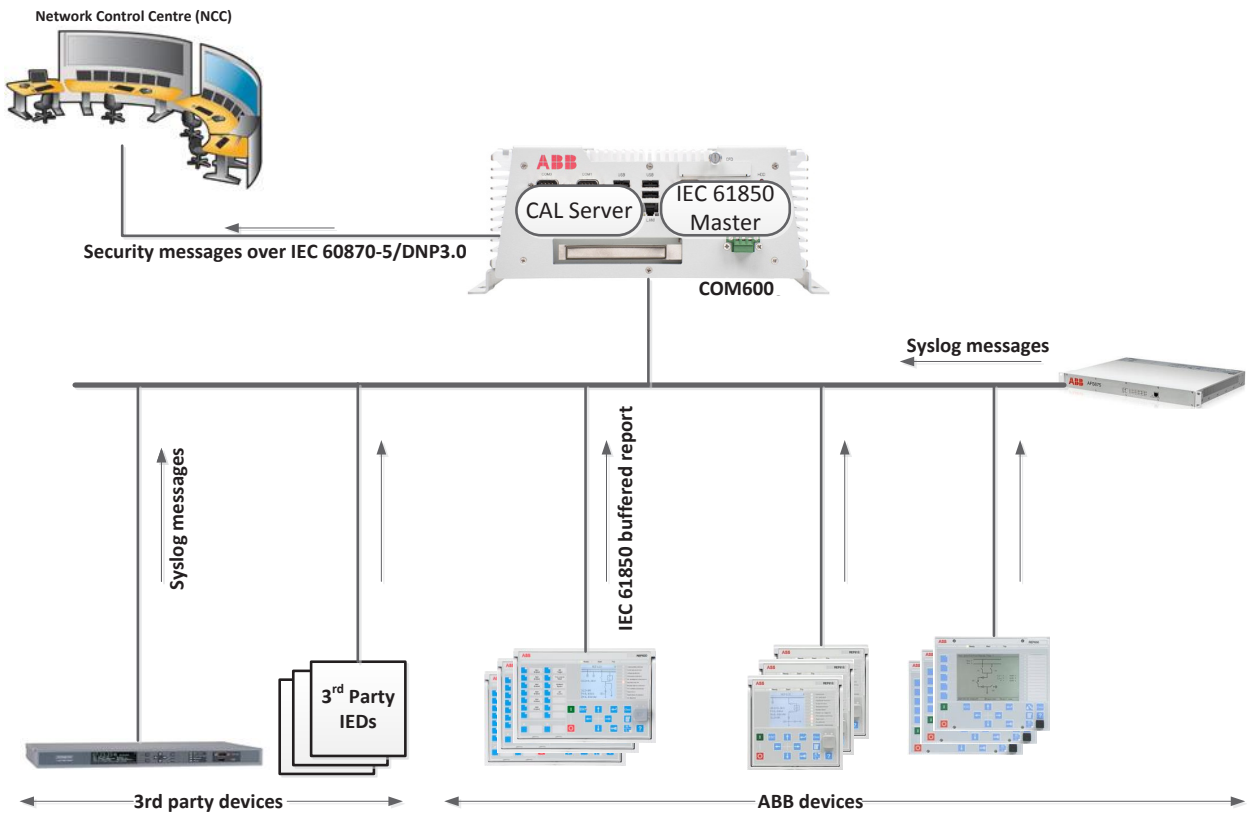


Figure 17. Handling of system security alarms and events

Date	Time	User Name	Event	Source	IP Address	Extra Information
29.4.2014	15:23:53	COM600	Log-in successful [1110]	COM600-PC	127.0.0.1	COM600-PC
29.4.2014	15:23:47	COM600	Log-out (user logged out) [1210]	COM600-PC	127.0.0.1	
29.4.2014	15:23:47	COM600	Date and time set successfully [8020]	COM600-PC	127.0.0.1	2014/4/29-15:23
29.4.2014	15:23:47	COM600	Date and time set successfully [8020]	COM600-PC	127.0.0.1	2014/4/29-15:23
28.4.2014	19:54:13	Anonymous	Connection with configuration tool successful [1310]	COM600-PC	127.0.0.1	

Figure 18. Handling of system security alarms and events

14. Specific support features for other protection and control relays

The COM600F incorporates a few special process displays and status/control dialogs for:

- capacitor back protection and control using Relion REV615
- cPMS load-shedding solution using Relion PML630

For more information and details please refer to respective product manuals.

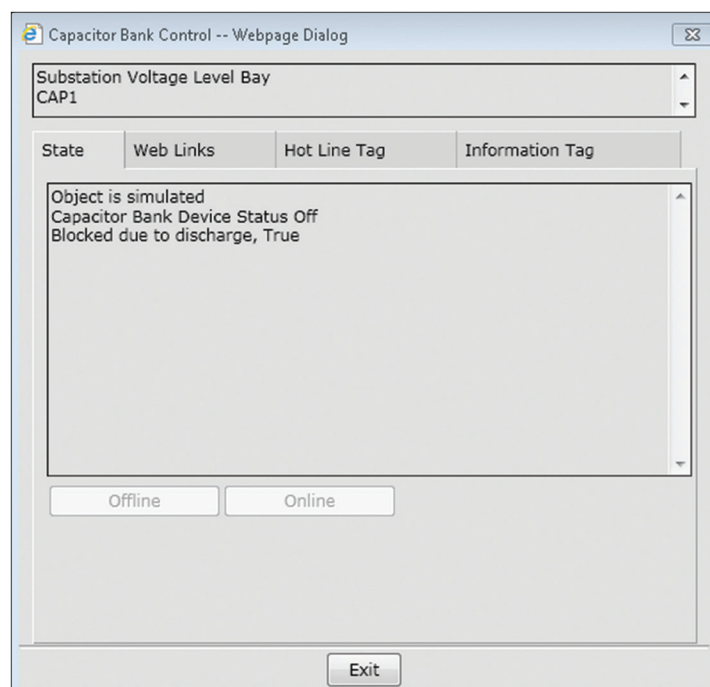


Figure 19. Status/control dialog: Capacitor bank control

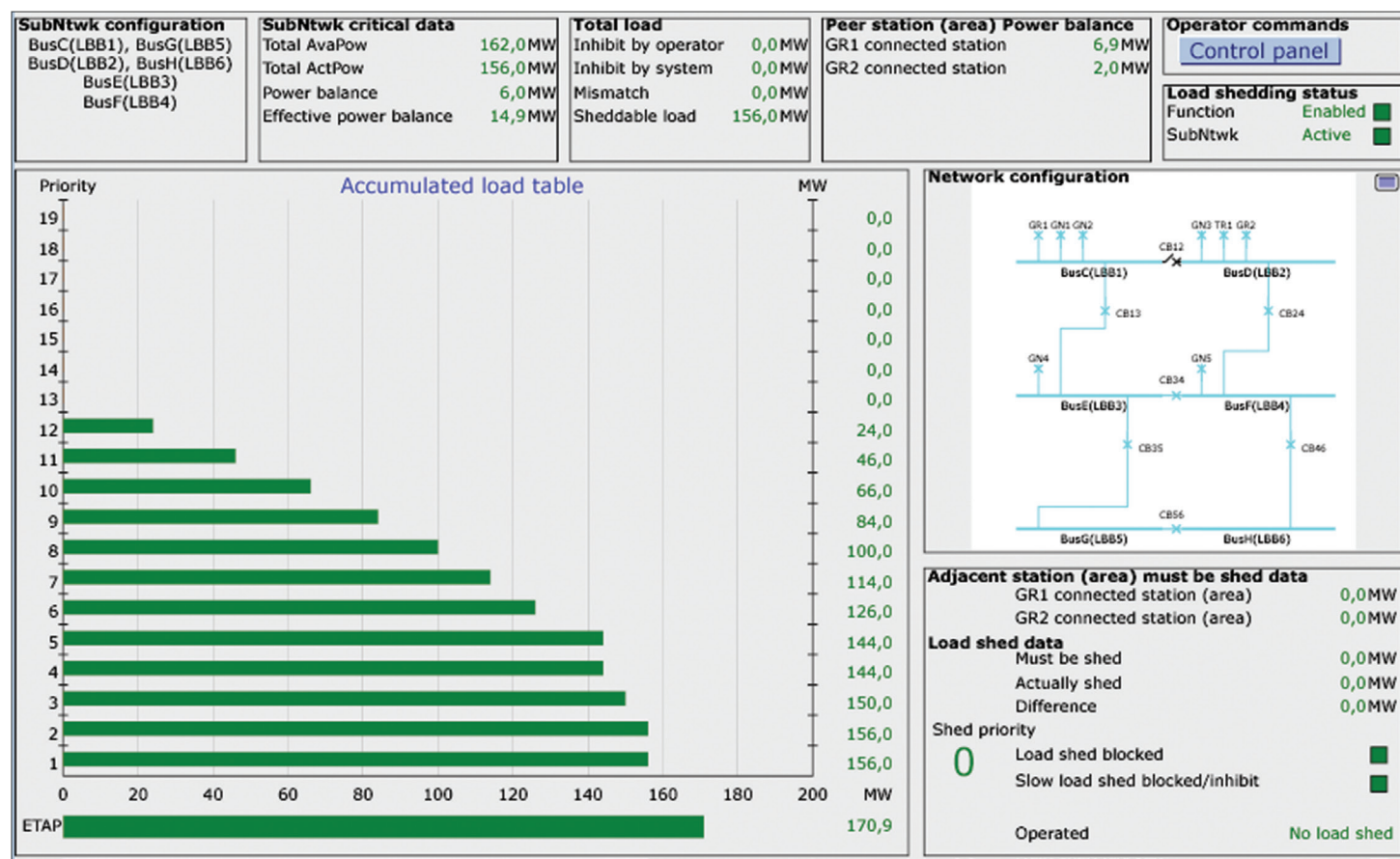


Figure 20. cPMS load-shedding: Subnetwork display

15. Integration of ABB protection and control relays

The COM600F supports ABB's connectivity package concept which simplifies system configuration and the integration of protection and control relays. A connectivity package is a collection of software and protection and control relay-specific information, which enable system products and tools to connect and interact with the protection and control relay. The connectivity packages reduce the risk of errors in system integration, minimizing device configuration and set-up times. Engineering in the COM600F is done by selecting the connectivity package for the protection and control relay version and configuration or by importing the protection and control relay configuration file.

16. Integration with other ABB and 3rd party systems, protection and control relays

The COM600F offers connectivity to ABB's Automation System 800xA and MicroSCADA by means of OPC or other communication protocols.

Other 3rd party systems/protection and control relays too can be integrated with the COM600F using any of the supported standard protocols, mentioned earlier.

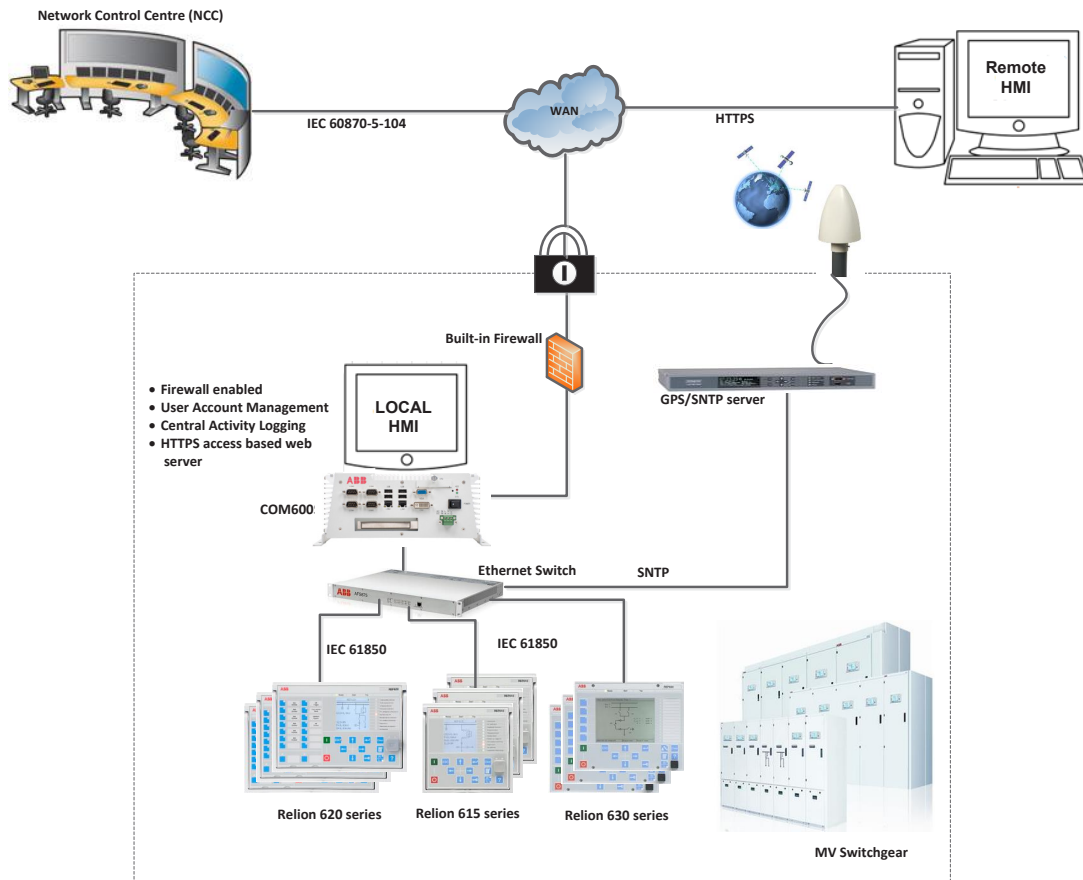


Figure 21. Substation security and secured Web HMI for remote access

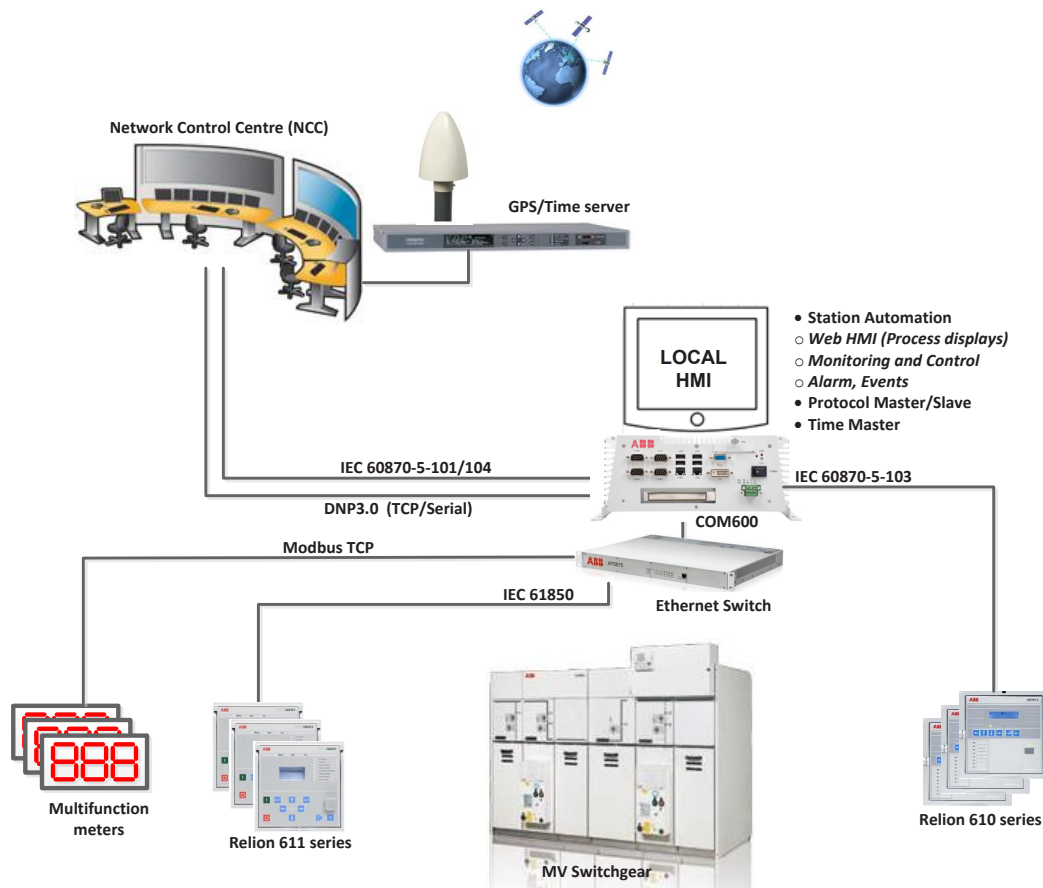


Figure 22. Distribution automation controller for secondary distribution substations

17. Commissioning and troubleshooting

Besides its GOOSE Analyser feature, the COM600F also offers several tools and functions to support efficient commissioning and troubleshooting of the substation. The COM600F's built-in protection and control relay simulation functionality enables the testing and verification of the HMI and gateway configuration without any physical connection to protection and control relays and external systems. Further, communication diagnostic events can be enabled to track all messages being sent or received by COM600F.

Using the Station Automation Builder SAB600 (COM600F configuration tool), on-line diagnostic data, real-time process data and communication channels can be analyzed without the need for separate protocol analyzers.

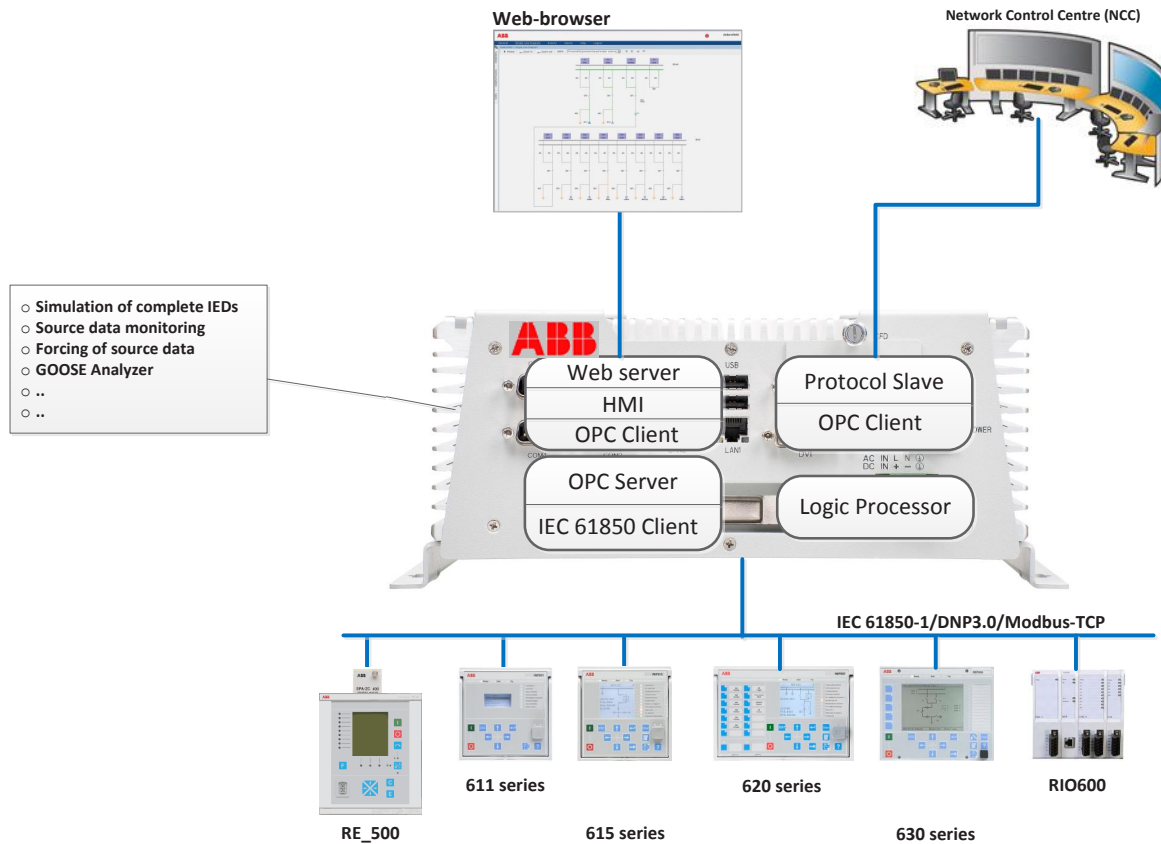


Figure 23. Commissioning and troubleshooting

18a. Communication interfaces

By default COM600 Rackmount is equipped with:

- 2 Ethernet interfaces
- 4 serial interfaces

18b. Communication interfaces

By default COM600 Subplate mount is equipped with:

- 2 Ethernet interfaces
- 2 serial interfaces

As mentioned in section 1, COM600F will be enabled with the IEC 61850 master protocol by default. Hence, the planning of the remaining Ethernet interfaces need to be considered accordingly.

Master and Slave protocols

As the COM600F is inherently designed to support the IEC 61850 standard, it can easily and conveniently be integrated an IEC 61850 based substation automation network. The COM600 series supports both IEC 61850-8-1 MMS and GOOSE profiles for vertical and horizontal communication with compliant protection and control relays.

Apart from IEC 61850, COM600F also supports other standard, de-facto and legacy master communication protocols like IEC

60870-5-101, 103, 104, DNP3.0 (TCP and serial), OPC, Modbus (TCP and serial) and ABB's legacy SPA (LAN and serial). This enables the connectivity of both IEC 61850 and non-IEC 61850 based devices (meters, protection and control relays, substation controllers etc.) to the substation automation network. Besides, the COM600F also supports SNTP (Simple Network Time Protocol) for time synchronization and SNMP (Simple Network Management Protocol) for network management.

In order to adapt non-IEC 61850 devices to a IEC 61850 network, the COM600F can also act as a IEC 61850 proxy server converting incoming and outgoing data from/to the external devices. The IEC 61850 proxy server of COM600F is, thereby, very useful during system extensions. The IEC61850 proxy server feature can also be used in cases where the COM600 series needs to serve as an IEC61850 data source (protection and control relay).

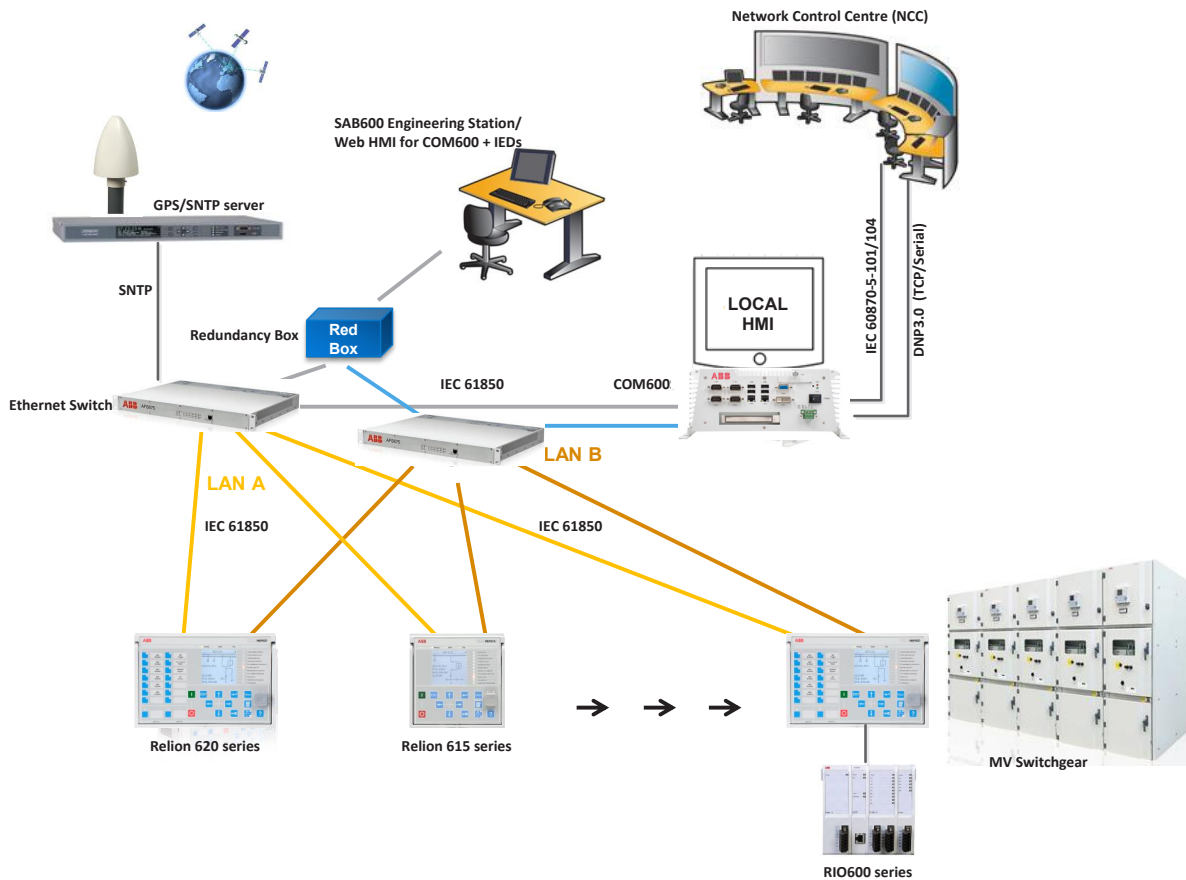


Figure 24. COM600 series in PRP configuration with other Relion series protection and control relays

Note: When IEC 61850 Proxy server is opted for, only one additional slave protocol can be added.

Typical IEC 61850 devices generate vast amount of data. In some cases, it may be necessary to limit the amount of data sent to the SCADA or DCS in order to avoid unnecessary information overflow/handling. The SAB600 cross-reference tool is used to selectively map substation information (from substation devices) or data generated by COM600F itself to slave protocols like IEC 60870-5-101, 104, DNP3.0 (LAN and serial), OPC and Modbus (TCP and serial). Reducing information to higher level systems not only reduces load but also increases operational security. For example, it is possible to disable control actions from a certain higher level system.

The COM600 series's OPC client and server connectivity enables data access and data sharing between external systems supporting OPC.

Redundancy

To maintain and improve the reliability of the communication network and the communication between the protection and control relays and COM600F, IEC 62439/PRP (Parallel Redundancy Protocol)-based communication is supported. PRP is based on duplicated networks, where each message is sent via both networks. The first of the received messages is accepted, whereas the duplicate is discarded. Message replication and discarding is done by DuoDriver in COM600F. Further, DuoDriver hides the two networks from upper-level applications. IEC 62439/PRP-based communication requires that COM600F is equipped with an optional LAN card and that the protection and control relays that are used support PRP.

However, COM600F does not support the High-Speed Redundancy ring (HSR) protocol. In order to adapt itself to work in such a communication network, COM600F needs to be connected to an external redundancy box.

20. Customer value

The COM600F's Web HMI, communication gateway, automation and protection and control relay infrastructure integration features will always be available together. As a result the below customer value aspects need to be considered together for value addition.

Integrated medium voltage switchgear with substation automation

- Easy to add substation automation to existing protection and control installation
- Closer integration with Relion protection and control relays
- Always IEC 61850 ready with integrated HMI.
- Easy adaptation of legacy protection and control relay infrastructure to IEC 61850, without the need to discard them (through IEC 61850 proxy server). GOOSE communication can therefore be enabled between newer IEC 61850 protection and control relays and older protection and control relays through COM600 series.
- Soft-wiring monitoring and GOOSE based application monitoring (such as load-shedding etc.) using GOOSE Analyzer feature
- If SCADA or DCS connectivity for substation control fails, a quick 'portable' PC can be arranged as HMI.
- Centralized automated disturbance record collection, viewing and transfer
- Digital documentation of all substation drawings and manuals
- Historical data storage could be used to retrieve and represented in trends, reports and to also execute substation functionality with historical data.
- In a packaged solution, customer gets benefits of integrated IEC 61850 substation that brings in combined features of substation HMI, gateway, user access and operational security and station level applications.

21. Technical data for COM600 series

Table 1. Dimensions

Description		Value
Subplate mount	Width	251.2 mm (284 mm with mounting kit)
	Height	103 mm (114 mm with mounting kit)
	Depth	313 mm
Rackmount	Width	481.33 mm (482.6 mm rack mount)
	Height	76.2 mm
	Depth	290.576 mm

Table 2. Power supply

Description	Value (Power supply "H")	Value (Power supply "L")
U_{BUX} nominal	110...220 V DC 100... 240 V AC (50...60 Hz)	24...60 V DC
U_{BUX} variation	80...120% of U_n (88...264 V DC), 90...110% of U_n (90...264 V AC)	80...120% of U_n (19...72 V DC)
Power consumption	Typical 32 W (with 110 V DC)), max. 55 W (with 110 V DC)	Typical 25 W (with 24 V DC)), max. 51 W (with 24 V DC)
Power consumption at start-up	220 W	

Table 3. Hardware

Description	Value
Processor	Core 2 Duo 2.26 Ghz (P8400)
System memory	4 GB RAM
Compact flash memory	32 GB Industrial Compact Flash
Real Time Clock Battery	Lithium battery

Table 4. Interfaces

Description	Value
Subplate mount serial interfaces	3 x RS-232 interfaces 1 x RS-232/485 serial interface
Rackmount serial interface	2 x RS-232/485 serial interface
Ethernet interfaces	2 x 10BASE-T/100BASE-TX/1000BASE-T RJ-45 interfaces
USB	4 x USB 2.0 interfaces

Table 5. Optional PCI extensions

Description	Value
Serial interfaces ¹⁾	8 x RS-232/485 serial interfaces
Ethernet interfaces ²⁾	2 x 10BASE-T/100BASE-TX/1000BASE-T RJ-45 interfaces

¹⁾ Operating temperature 0° C - +55° C

²⁾ Operating temperature 0° C - +55° C

Table 6. Operating System

Description	Value
Operating System	Windows Embedded Standard 7

Table 7. Inspection of mechanical structure

Description	Reference
Markings and mechanical structure	According to IEC 60255-1, -5
Degree of protection by enclosure	According to IEC 60529
Clearance and creepage distances	According to IEC 60255-5

Table 8. Power supply and module tests

Description	Reference
Subplate mount auxiliary voltage	According to IEC 60255-1
Rackmount auxiliary voltage	According to IEC 60255-1 and ANSI/IEEE C37.90-2005
Aux. voltage interruptions	According to IEC 60255-11
Ripple in auxiliary DC voltage	According to IEC 60255-11 15%, $f = 2 \times f_0$
Power consumption	According to CE EN 61010

Table 9. Insulation tests

Description	Reference
Subplate mount dielectric test	According to IEC 60255-5 2 kV, 50 Hz for 1 minute
Rackmount dielectric test	According to IEC 60255-5 and ANSI/IEEE C37.90-2005, 50 Hz for 1 minute
Subplate mount impulse voltage test	According to IEC 60255-5 5 kV, 1.2/50 μ s, 0.5 J
Rackmount impulse voltage test	According to IEC 60255-5 and ANSI/IEEE C37.90-2005, 1.2/50 μ s, 0.5 J
Insulation resistance	According to IEC 60255-5 >100 M Ω , 500 Vdc
Protective bonding impedance	According to IEC 60255-27 <0.1 Ω .

Table 10. Electromagnetic compatibility tests

Description	Reference
Subplate mount 1 MHz and 100 kHz burst disturbance test:	According to IEC 61000-4-18, IEC 60255-22-1:
Common mode	2.5 kV
Differential mode	1.0 kV
Rackmount 1 MHz and 100 kHz burst disturbance test:	According to IEC 61000-4-18, IEC 60255-22-1, ANSI/IEEE C37.90.1-2012:
Common mode	2.5 kV
Differential mode	1.0 kV
Subplate mount electrostatic discharge test:	According to IEC 61000-4-2, IEC 60255-22-2, and ANSI/IEEE C37.90.3:
Contact discharge	6 kV
Air discharge	8 kV
Rackmount electrostatic discharge test:	According to IEC 61000-4-2, IEC 60255-22-2, and ANSI/IEEE C37.90.3:
Contact discharge	6 kV
Air discharge	8 kV
Radio frequency field immunity	According to IEC 61000-4-3 and IEC 60255-22-3, 10 V/m (80% amp.mod.), $f=80\ldots2700$ MHz, 10 V/m (pulse mod.) $f=900$ MHz
Subplate mount fast transient:	According to IEC 61000-4-4, IEC 60255-22-4, and IEEE C37.90.1-2012:
Power supply	2 kV
RJ-45 port	1 kV
Rackmount fast transient:	According to IEC 61000-4-4, IEC 60255-22-4, and IEEE C37.90.1-2012:
Power supply	2 kV
RJ-45 port	1 kV
Surge immunity:	According to IEC 61000-4-5 and IEC 60255-22-5:
Power supply	2 kV line-to-earth, 1 kV line-to-line
Conducted radio frequency disturbance	According to IEC 61000-4-6 and IEC 60255-22-6, 10 V (80% ampl. mod.) $f=150$ kHz...80 MHz
Power frequency (50 Hz) magnetic field	According to IEC 61000-4-8, 300 A/m, continuous
Voltage dips and short interruptions	According to IEC 61000-4-11, 30% reduction for 10 ms, 60% reduction for 100 ms, 60% reduction for 1000 ms, >95% reduction for 5000 ms
Emission tests	According to EN 55011 and IEC60255-25, class A

Table 11. Environmental conditions

Description	Value
Operating temperature range	-25...+70°C ^{1) 2)}
Relative humidity range, non-condensing	5...95% at +40 °C
Storage temperature	-40...+70°C

¹⁾ Without any option cards

²⁾ With Ethernet option card: 0...+55°C, with Serial option card: 0...+55°C

Table 12. Environmental tests

Description	Reference
Dry heat test	According to IEC 60068-2-2, test values: 96 h at +55°C, 4 h at +70°C
Cold test	According to IEC 60068-2-1, test values: 96 h at -10°C, 4 h at -25°C
Damp heat test, cyclic	According to IEC 60068-2-30, test values: 6 cycles (12+12h) at +25...55°C, humidity >93%
Subplate mount storage test	According to IEC 60068-2-48, test values: 72 h at +70°C, 72 h at -40°C
Rackmount storage test	According to IEC 60068-2-48 and IEEE C37.90.2005 test values, test values: 72 h at +70°C, 72 h at -40°C

Table 13. Mechanical tests

Description	Reference
Vibration tests:	According to IEC 60068-2-6 and IEC 60255-21-1:
Vibration response test	f = 10...150 Hz, ± 0.035 mm, 10...58 Hz, 5 m/s ² 58...150 Hz
Vibration endurance test	f = 10...150 Hz, ± 0.075 mm, 10...58 Hz, 10 m/s ² 58...150 Hz
Shock and bump tests:	According to IEC 60068-2-27, IEC 60068-2-29 and IEC 60255-21-2:
Shock response test	peak acceleration = 5 x gn, pulse duration = 11 ms, numbers of pulses in each direction = 3
Shock withstand test	peak acceleration = 15 x gn, pulse duration = 11 ms, number of pulses in each direction = 3
Bump test	peak acceleration = 10 x gn, pulse duration = 16 ms, number of pulses in each direction = 1000
Seismic test:	According to IEC 60255-21-3 test method B:

Table 14. EMC compliance

Description	Reference
Complies with the EMC directive	2004/108/EC
Standards	EN 50263 (1999), EN 60255-26 (2008), EN 61000-6-2 (2005), EN 61000-6-4 (2007)

Table 15. Product safety

Description	Reference
Complies with the LV directive	2006/95/EC
Standards	EN 60255-27 (2005), EN 60255-1 (2009)
UL recognized component for USA and Canada	UL-file number E 231775

Table 16. RoHS compliance

Description	Reference
Complies with the RoHS directive	2002/95/EC

Table 17. Communication protocols

Master protocol	Slave protocol
DNP3 LAN/WAN	DNP3 LAN/WAN
DNP3 serial	DNP3 serial
IEC 60870-5-101	IEC 60870-5-101
IEC 60870-5-103	
IEC 60870-5-104	IEC 60870-5-104
IEC 61850-8-1 (MMS & GOOSE)	IEC 61850-8-1 (MMS & GOOSE)
Modbus Serial	Modbus Serial
Modbus TCP	Modbus TCP
SNMP (Simple Network Management Protocol)	
SNTP (Simple Network Time Protocol)	SNTP
SPA	SPA Router

Table 18. protection and control relays with connectivity packages supporting COM600 series (applies for the IEC 61850 and SPA protocols)

610 series protection and control relays	all variants
611 series protection and control relays	all variants
615 series protection and control relays	all variants
620 series protection and control relays	
Recloser Protection and Control RER620	
Feeder Protection Relay REX 521	
SPAJ 140 series relays	Combined Phase and Neutral Overcurrent Relay SPAJ 140 C Combined Phase and Neutral Overcurrent Relay SPAJ 141 C Combined Phase and Neutral Overcurrent Relay SPAJ 142 C
Combined Phase and Neutral Overcurrent Relay SPAJ 144 C	
Stabilized Differential Relay SPAD 346 C	
SACO 16D series units	Digital Annunciator Unit SACO 16D1 Digital Annunciator Unit SACO 16D3
Digital Annunciator Unit SACO 64D4	
RE 500 series terminals	Feeder Terminal REF 541 / 543 / 545 Transformer Terminal RET 541 / 543 / 545 Motor and Generator Terminal REM 543 / 545 Feeder Terminal REF 542plus

Common aspects

Table 19. Hardware requirements for SAB600

Hardware	Minimum	Recommended
Free hard disk space	5 GB	10 GB

Table 20. Supported operating systems¹⁾

Description
Windows 7, Windows 8, Windows Server 2012 (active); also works with Windows XP, Vista and Windows Server 2003, 2008

¹⁾ Microsoft® .NET Framework 4.0 is required for running SAB600. The software is automatically installed during the installation of SAB600 if not already available on the PC.

Table 21. Supported web browsers for HMI

Description	Version	Recommended version
Microsoft Internet Explorer	8.0/9.0* or later	9, 10, 11
Mozilla Firefox®	3	Latest version or latest ESR
Google Chrome	29 or later	Latest version

22. Tools

The engineering of COM600F is done offline on a separate computer using the Microsoft® .NET-based SAB600 engineering tool supplied with COM600F. The configurability and functionality of COM600F depends on the communication protocol used for communication between COM600F and the protection and control relays. The connectivity packages for ABB's protection and control protection and control relays enable an efficient configuration of COM600F. The connectivity packages include descriptions of the data and signals available in the protection and control relays. The descriptions are used to automatically configure the master communication of COM600F.

At project engineering, SAB600 uses the potential of the IEC 61850 standard by supporting the IEC-61850-based SCL (Substation Configuration Description Language) file import, including the import of the communication and graphical parts of the SCL file. The finalized projects are updated from SAB600 to COM600F at site or remotely provided that a secure Ethernet connection is available.

Table 22. Tools

Description	Version
Station Automation Builder SAB600	4.1

23. Mounting

The COM600F computer is designed for mounting both into a control panel or in the low voltage compartment of a switch-gear panel by using the included wall-mount kit. COM600F is fastened using the four holes on the unit and four screws.

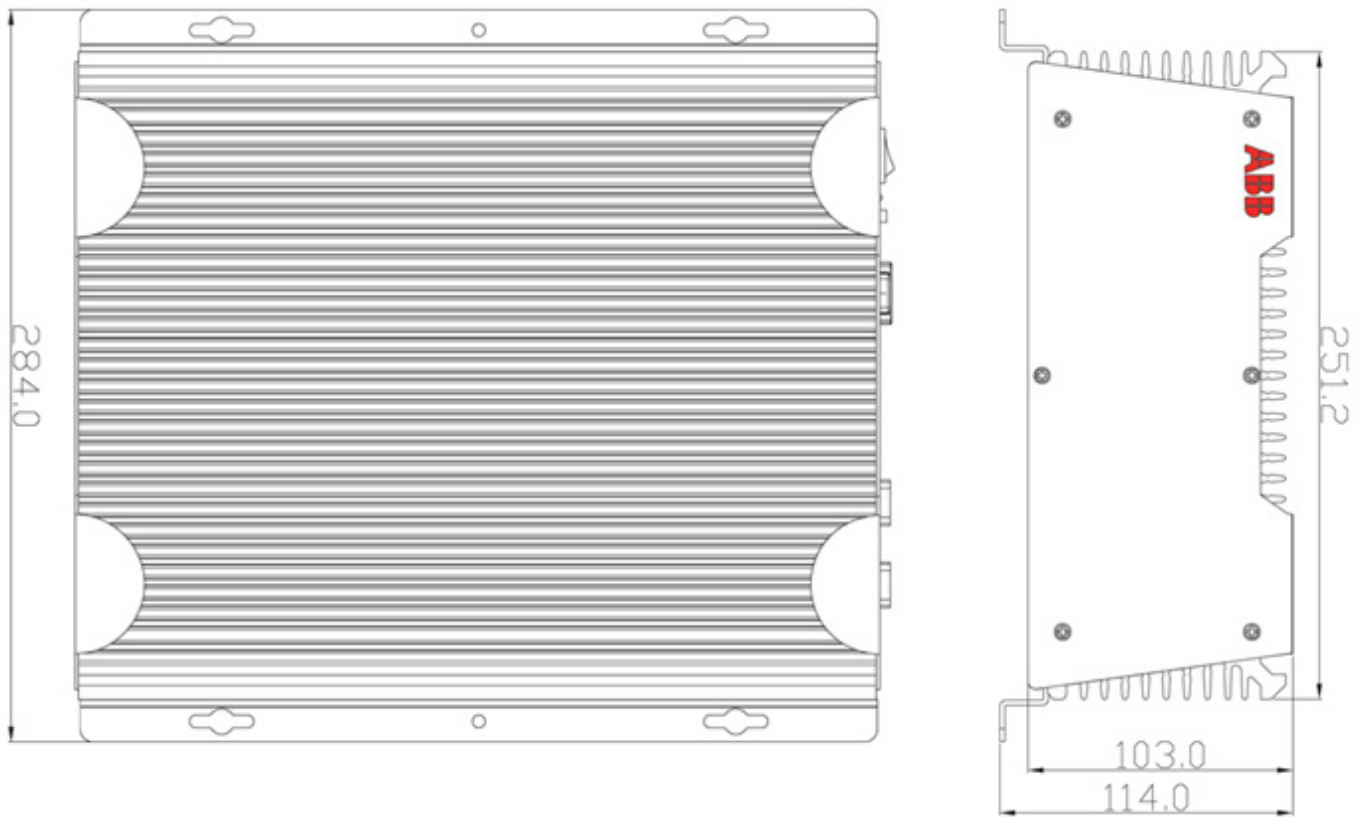


Figure 26. COM600F top and side view

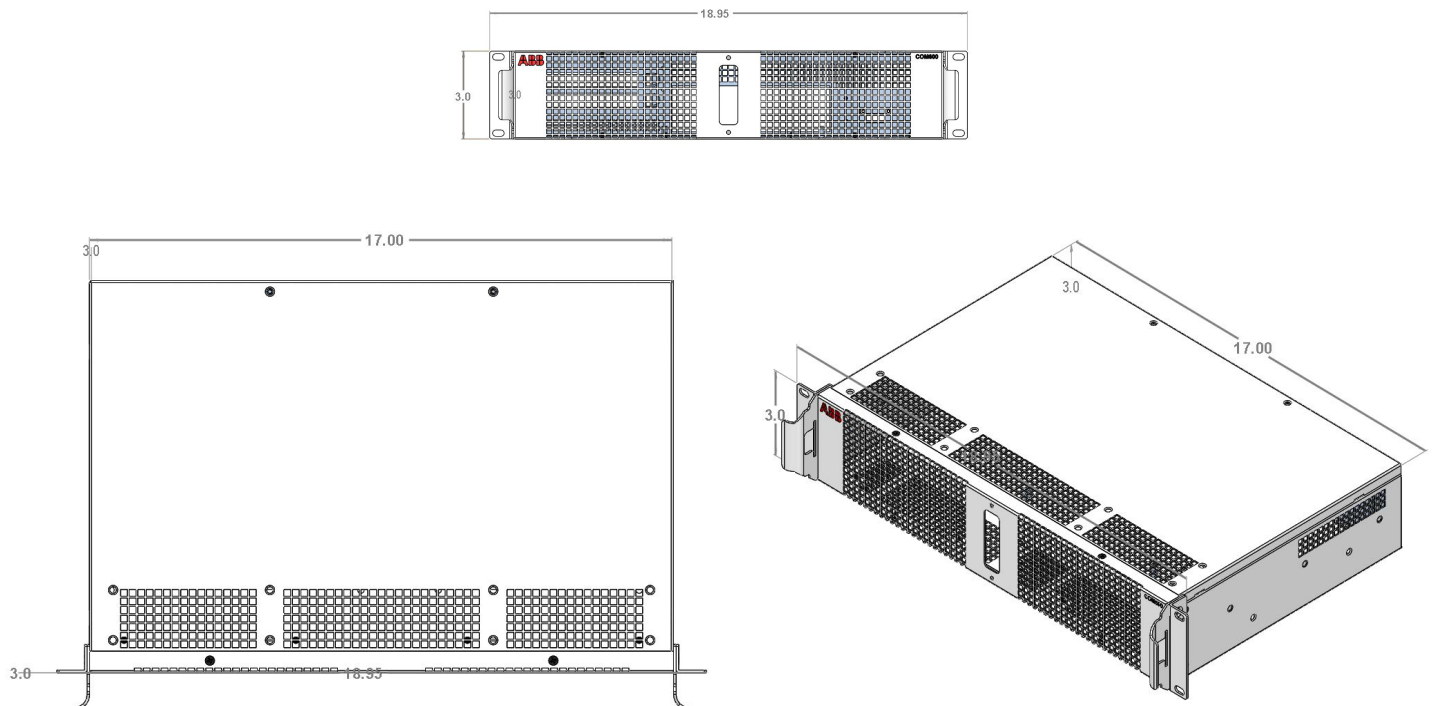


Figure 27. COM600R top and side view

24. Selection and ordering COM600F order code

The COM600F order code reflects the new approach that has been described in the chapter General Description.

The intent with the various characters is as follows:

- Digit 8 represents the 'High Voltage' or 'Low Voltage' power supply, reflecting the installation (switchgear or non-switchgear) environment and the available control power supply.
- Digit 9 represents the requirement to have additional Ethernet or serial interface cards, reflecting the type and size of the substation automation infrastructure to be integrated with COM60F.
- Digit 10 is assigned to the pre-loaded libraries and functions, in line with the product type
- Digit 11 is assigned to the number of additional master protocols, besides the default IEC 61850.
- Digit 12 is assigned to the number of slave protocols (only one additional slave protocol can be selected, if IEC 61850 proxy server is opted).
- Digit 13 is assigned to the advanced features that are available from the COM600F products like Data Historian and Logic Processor (user training is recommended for using these features).
- Digit 14 is assigned to the optional IEC 61850 functionality, that as a IEC 61850 proxy server and the GOOSE Analyzer features (user training is recommended for using these features).
- Digit 15 is in anticipation of the usage of COM600F in a substation network with only ABB devices OR in a network with mix of both ABB and non-ABB/3rd party devices OR a 'loose' unit purchase. In the last option, it is assumed that purchaser has sufficient independent system integration capabilities.
- Digit 16 is assigned for mounting selection

The type and serial number label identifies the COM600F units. The order number consists of a string of code generated from the hardware and software modules of the unit. Use the ordering key information in Figure 28. to generate the order number when ordering.

	Digit		1-7	8	9	10	11	12	13	14	15	16	17	18
New Digit	New Description	New Key	COM600F series	H	R	F	2	1	P	A	B	A	N	E
8) Power supply	110 - 220 V DC, 100 - 240 V AC	H		H										
	24 - 60 VDC	L												
9) Optional communication cards (PCI)	Ethernet card (RJ-45) 10Base-T, 100Base-TX, 1000Base-T, 2 port	R			R									
	Serial RS-232/RS-485 card, 8 port	S												
	None	N												
10) Functions/Applications	Station Automation (default)	H												
	Feeder automation (includes FDIR, requires option L or P digit 13)	F				F								
11) Additional number of Master protocols	Second master protocol	2					2							
	Third master protocol	3												
	None	N												
12) Number of Slave protocols	First slave protocol	1						1						
	Second slave protocol	2												
	None	N												
13) Optional software (advanced features)	Data historian	T												
	Logic processor	L												
	Data historian and Logic processor	P							P					
	None	N												
14) Optional IEC 61850 functionality	IEC 61850 proxy server and GOOSE send enabled	P												
	GOOSE Analyzer enabled	G												
	IEC 61850 proxy server, GOOSE send + GOOSE Analyzer enabled	A								A				
	No optional IEC 61850 functionality	N												
15) Device integration	Only with ABB protection and control relays/relays	A									B			
	With 3rd party protection and control relays/relays	B												
	Unit only (configuration by certified integrators)	C												
16) Mounting type	Subplate mount	A										A		
	Rackmount	R												
17) Vacant		N											N	
18) Version	v4.1	E												E

Figure 28. Your ordering code

25. References

The www.abb.com/substationautomation portal offers you information about the distribution automation product and service range. You will find the latest relevant information on the COM600 series unit on the product page. The download area on the right hand side of the web page contains the latest product documentation, such as user's guide, operator's guide, etc. The Data and Optional features tabs contain product related information in a compact format.

26. Document revision history

Document revision/date	Product version	History
A/April 30, 2015	4.1	Document was created
B/December 17, 2016	4.1	Content updated
C/ May 2, 2016	4.1	Content updated

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