Smart control cabinets

Solutions for automating the secondary distribution network

The rising demand for improved reliability and availability of power supply requires an increase in automation of the secondary distribution network. ABB's portfolio of smart control cabinets offers a convenient and cost-effective solution for effortless integration – equally suitable for new and retrofit installations.

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Flexible and ready-made solutions for easy and cost-effective integration

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01 Advanced fault location solution with the remote monitoring and control relay REC615 for network management and the remote I/O unit RIO600 for fault passage indication in a compensated network

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02 Pole-mounted control cabinet connected to an overhead-line recloser

ABB has developed a wide portfolio of control cabinets to be able to meet today's diverse and evolving customer requirements within power distribution. The ready-made solutions offer a cost-effective and convenient way to increase automation in the distribution network to improve the availability and reliability of power supply. The modular cabinet design also supports fully customized solutions. Secure connectivity over the wireless network makes accessing the remote assets both easy and cost-effective.

Improved availability and reliability of power supply

Uninterrupted power supply is not only a practical necessity in everyday life and business, but is also crucial to securing the availability of vital public services, such as emergency services, infrastructure and other important locations, such as commercial centers.

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Early warnings and alternative supply routes are crucial to securing uninterrupted power supply to critical locations.

In an emergency, locating the fault quickly and accurately, applying selective fault isolation, and quick restoration of power (FLIR) are of the utmost importance to ensure that interruptions in power supply are reduced to an absolute minimum. Access to real-time grid information facilitates accurate decision-making when meeting emerging network requirements, such as energy savings, demand response, integration of distributed generation and support for charging electrical vehicles.

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Cost-effective and convenient with ready-made solutions
ABB's control cabinet portfolio offers cost-effective, ready-made and easy-to-install solutions for both cable and overhead line networks. The cabinets are equally suitable for new and retrofit installations.

The cabinets come in different sizes and materials depending on the available space and the installation environment. Different mounting options are also available depending on the application.

Customization freedom with modular cabinet design
The modular design of the cabinet allows tailored solutions to meet customer-specific requirements, whereas the scalable design allows adaptation of the cabinet to suit a variety of primary equipment by implementing an appropriate level of automation:
- Situational awareness with remote monitoring
- Fault isolation with remote control
- Power flow management with advanced fault passage indication (FPI)
- Protection selectivity when breakers are integrated

Wireless connectivity for easy and secure access to remote communications assets
The growing demand for increased automation of existing secondary substations challenges the communication system when it comes to transferring real-time data and managing remote communications assets. Easy integration of wireless communication, together with the possibility to easily access and manage remote communication assets from a central location, are key to cost-effective management and maintenance of both the communication system and the distribution network.

The control cabinets have been designed to utilize existing public, wireless GPRS, 3G and LTE networks as the backbone for communication, providing a secure and cost-effective platform for substation automation. The support for a variety of standard communication protocols allows effortless integration with SCADA (Supervisory Control and Data Acquisition).

Portfolio benefits
- Improved quality of power supply through less and shorter outages limited to a restricted part of the distribution network
- Improved safety for the utility personnel through more exact fault location information
- Improved operational efficiency through better tools for operators and field crew
- More efficient utilization of the distribution network by minimizing network losses
- Comprehensive and selective protection of the distribution network (automation level 4)

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Smart control cabinets for cable and overhead-line networks

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01. Compact, wall-mounted GAI1 cabinet with the wireless I/O gateway ARR600 and battery backup
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02 Compact, wall-mounted GAI3 cabinet with the wireless controller ARC600 and the remote I/O unit RIO600 for advanced FPI
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03. Wall-mounted GAI3 cabinet for mounting, for example, next to an RMU inside a CSS
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04 Top-mounted GAI3 cabinet designed for installation on top of an RMU
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05 GAO2, GAO3 and GAO4 control cabinets for overhead-line networks

The cable network includes a large amount of secondary and compact secondary substations (CSS), especially with ring main units (RMU), and the overhead-line network a large amount of pole-mounted switch disconnectors and overhead-line reclosers, of which only a few are remotely controllable.

ABB's smart control cabinet portfolio includes four ready-made solutions for cable networks (GAI) and four for overhead-line networks (GAO), one for each of the four levels of functionality and automation. In addition to the standardized offerings, the cabinets can be flexibly tailored to meet customer-specific requirements.

The range of control cabinets for cable networks comes in different sizes and materials and can be flexibly mounted to suit a variety of installations, whereas the cabinets for overhead-line networks have been adapted to withstand demanding outdoor conditions.

Standard features

- Supply voltage 110-250 VAC/VDC
- Surge protection T2
- Battery backup with charging and supervision
- Control circuit 24 VDC
- Ventilated cabinet, IP43 or IP55 (GAI) and IP55 (GAO)
- Anti-condensation heater
- Fixing accessories for wall (GAI) and pole (GAO) mounting
- Cabinet enclosure in painted metal sheet, stainless steel or fiberglass-reinforced polyester (GAI) and stainless steel (GAO)
- Plug-in connectors for easy connection to switchgear (GAI) and main apparatus (GAO)
- Interface for communication over public wireless networks

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Smart control cabinets for cable (GAI) and overhead-line (GAO) networks

Functions	GAI1	GAI2	GAI3	GAI4	GAO1	GAO2	GAO3	GAO4
Monitoring of binary inputs connected to primary device	•	•	•	•	•	•	•	•
Control of binary outputs connected to primary device		•	•	•		•	•	•
Accurate measurements			•	•			•	•
Advanced fault passage indication			•	•			•	•
Comprehensive and selective protection of the distribution network with the Relion® family of relays				•				•
Battery backup with electronic temperature-compensated battery charger	•				•			
Battery backup with electronic temperature-compensated battery charger or advanced battery management system		•	•	•		•	•	•
GPRS, 3G and LTE communication to SCADA	•	•	•	•	•	•	•	•
Compact enclosure with pre-wired plug-in connectors	•				•			
Different types of compact enclosures with pre-wired plug-in connectors		•	•	•		•	•	•
Optional motor operating device integrated in the control cabinet to control air-insulated, pole-mounted switches (ABB's NPS switches or similar)						o	o	o
Optional actuator control unit for recloser control								o
Possibility to expand cabinet to control several objects in a branching connection point						•	•	

• =standard feature, o = optional

Optional features

- Fault passage indication
- Additional push buttons for local control
- Microswitch for door alarm (standard feature for GAO)
- Fixing accessories for mounting on top of switchgear or floor mounting (GAI)
- Auxiliary contacts for micro circuit breakers (MCB)s
- Fused supply socket
- Control circuit 48 VDC
- Service light
- Fused 12 VDC supply for additional radio equipment
- Different antenna options depending to customer specification
- Surge protection T1+T2
- Low auxiliary voltage indicator
- Low-voltage measurements (GAI)
- Communication with MV/LV measurement equipment (GAI)
- Connection interface for additional motor operating cabinets (GAO)
- Different battery management options for monitoring the battery health

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Bringing remote assets within reach
Secure wireless connectivity

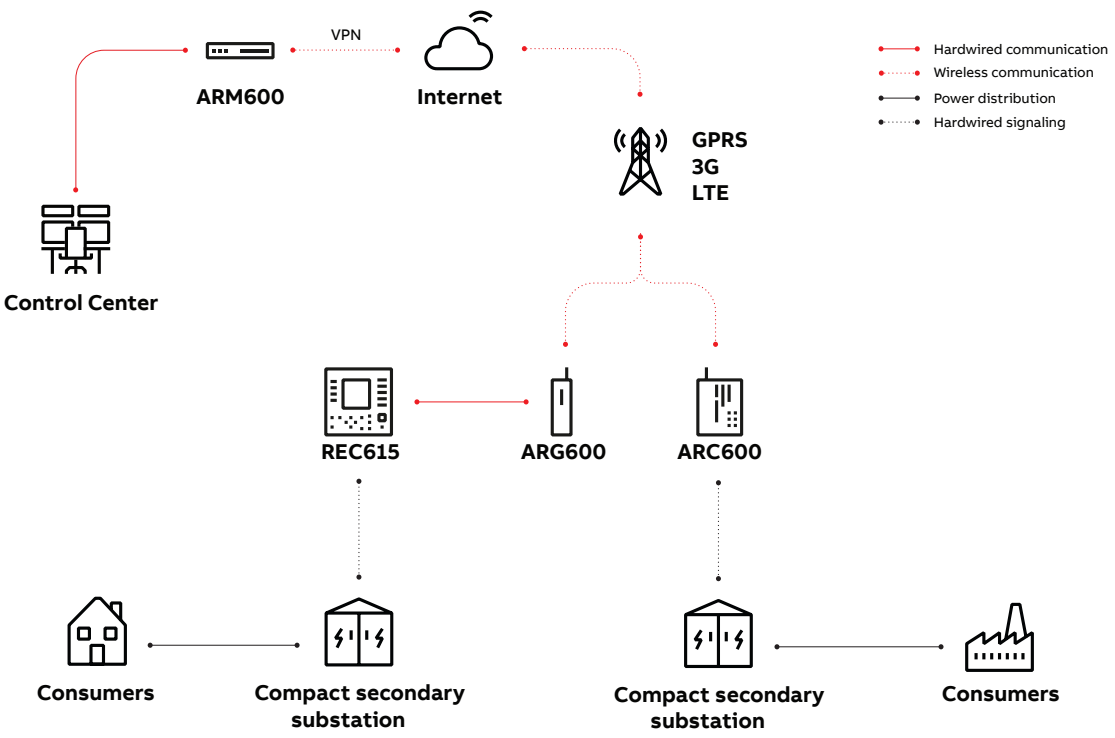
01 Complete end-to-end communication system

Secure and cost-effective connectivity with the Arctic family of wireless communication products
The Arctic family offers secure and cost-effective wireless connectivity for all industrial and utility applications, ranging from enabling the industrial Internet of Things to remote real-time grid automation. As the backbone for communication, the Arctic family utilizes public wireless networks, making it possible to combine the products into secure and cost-effective wireless communication systems with global coverage.

The Arctic products allow accessing and managing any remote asset from a central location. The result is a smarter distribution network and a more interconnected world. ABB employs strict cyber security measures to safeguard all network traffic between remote assets and the central monitoring and control system. The security features include:

- Virtual Private Network (VPN) connections between the M2M gateway ARM600 and remote Arctic gateways and controllers
- Private IP addressing – no access from external networks
- Firewall in every Arctic device
- SIM card protected by PIN code
- User authentication

01 Communication flow in automated secondary distribution networks



The centrally located M2M gateway ARM600 includes a unique device management application – Arctic Patrol – used for supervision of communication links and remote management of Arctic gateways, controllers and the remote I/O unit RIO600. Arctic Patrol allows simultaneous updating of both the configuration and the firmware of up to 1,000 RIO600 units via the Arctic communication devices, which saves both time and money.

Arctic product family highlights

- Enables industrial Internet of Things (IoT)
- Allows wireless connection to any remote asset within any application
- Utilizes secure and cost-effective public wireless networks with global coverage
- Involves no network investment or maintenance costs other than for data transfer
- Allows wireless access to geographically remote areas inaccessible before
- Ensures optimal cyber security throughout

Key components for building a smarter grid

Relion® REC615 and RER615 protection and control relays

REC615 and RER615 are grid automation protection and control relays for remote monitoring and control, protection, fault indication, power quality analysis in medium-voltage secondary distribution systems. REC615 and RER615 can be applied to both new and existing secondary distribution substations. The relays enhance grid reliability, ranging from basic, non-directional overload protection to extended protection functionality with power quality analysis. REC615 and RER615 meet today's requirements for smart grids and support the protection of both cable feeders and overhead lines, in isolated neutral, resistance-earthed, compensated and solidly earthed networks.

Remote I/O unit RIO600

The remote I/O unit RIO600 allows maximum I/O flexibility and provides seamless IEC 61850 connectivity between substation binary and analog signals. RIO600 offers fault passage indication and allows high-accuracy current and voltage measurements from the medium-voltage network, utilizing ABB's lightweight sensor technology. Based on the measured values, the unit provides directional fault passage indication and reports it to the upper-level system

Arctic wireless controller ARC600

The wireless controller ARC600 is a compact device for remote control and monitoring of secondary substations, such as network disconnectors, load break switches and ring main units (RMUs). It enables the SCADA system to wirelessly monitor and control the field devices over cost-effective public wireless networks.

Arctic wireless gateways ARG600 and ARR600, and M2M gateway ARM600

The Arctic gateways provide reliable and secure monitoring and control of field devices over public wireless networks from a central location, in order to enable remote real-time grid automation. The devices offer industrial quality connectivity by supporting TCP/IP-based protocols, together with protocol conversion from legacy serial protocols.

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