

1. Description

RIO600 is designed to expand the digital and analog I/O of ABB's Relion® protection and control relays and to provide I/O for the COM600 substation automation unit using the IEC 61850 and Modbus TCP communication. Both galvanic RJ-45 and optical LC connectors are supported for Ethernet station bus communication. RIO600 can also be used in secondary substations for fault passage indication and power measurements reporting values directly to a peer protection relay or to an upper level system. RIO600 accepts three-phase sensor signals (voltage and current) and provides fault detection and metering functions.

RIO600 allows flexible I/O assignment and provides seamless IEC 61850 connectivity between the substation's input and output signals and the protection relay or the COM600 substation gateway ensuring improved functionality and performance. RIO600 supports both Edition 1 and Edition 2 versions of the IEC 61850 standard. RIO600 can also be used as a standalone device in grid automation applications.

RIO600 helps in simplifying and decreasing the wiring inside the substation by digitizing the hardwired signals. The fully hardwired traditional medium-voltage switchgear/substation control and protection system results in extensive I/O wiring, connecting devices in switchgear signaling to the external systems, for example, to the remote terminal unit (RTU) or other higher-level automation systems.

RIO600 provides additional I/O within the switchgear using Ethernet communication. The I/O signals can be efficiently transmitted between the protection relay or COM600 with fast, high performance IEC 61850 GOOSE communication. Alternatively, RIO600 can communicate with an upper level automation system using the widely accepted Modbus TCP automation protocol.

The binary input module can be used for sending binary input values from primary equipment or secondary systems to peer protection relays or an upper-level system. The binary output modules can be used to control equipment based on the control signal received from communication.

The smart control module (SCM) can be used for different switchgear applications to drive primary switches. The module enables the control of a combined three-position switch (disconnecter and earthing switch) used in gas insulated switchgears or standard two-position switches such as disconnecter or earthing switches. Alternatively, the heavy-duty output contacts of the SCM can be used as power outputs for circuit breaker trip circuits to make, carry and

break the belonging trip coil current. The module can also monitor the trip circuit supervision with external wiring and one binary input. Furthermore, the SCM can be used as a generic module with four binary inputs and four fast power outputs.

With the RTD/mA module, RIO600 can be used in different monitoring applications. RIO600 can receive temperatures (°C) via RTDs or analog input signals (mA) from various transducers or devices. The input current (mA) can be linearly scaled for various applications, for example, transformer tap changer position indication. The input value is forwarded to a peer protection relay or to an upper-level system. With the analog output module (AOM), RIO600 can control an external device having an mA input.

RIO600 also includes a measurement module with fault passage indication (FPI) functionality. This module is intended for grid automation applications where RIO600 enables accurate current and voltage measurements or only current measurement from a MV network using ABB's accurate and lightweight sensor technology. With this measurement module, RIO600 can be used as a stand-alone fault passage indicator unit. Based on the measured MV values, it can give voltage presence and directional FPI and report them to an upper-level system. This also enables power flow and power quality monitoring. The typical accuracy of line voltages, currents and active power is better than 0.5% and for other power measurements better than 1%.

The FPI functionality can be based on phase current measurements only. It provides a selective fault passage indicator for single phase earth faults in high-impedance earth networks, that is, in compensated, unearthed and high-resistance earthed systems. It can be applied as single-phase earth-fault FPI in case of overhead lines and underground cables, regardless of the earth-fault type (continuous, transient or intermittent) or the fault resistance value (low or high ohmic).

The FPI module incorporates the latest fault-detection algorithms used in the Relion family. With an easy-to-use multifrequency admittance-based (MFA) earth-fault detection algorithm, it accurately detects solid, resistive and intermittent earth faults. Practical sensitivity of up to 10 kΩ of the fault resistance can be achieved in symmetrical networks. This new functionality is suitable for high-impedance earthed networks, and especially for compensated and unearthed networks where accurate and selective earth-fault detection is more challenging due to low fault currents.

2. Modular design

RIO600 is built on an industrial hardware platform which provides the same reliability, performance and real-time functionality as ABB protection relays withstanding extreme

temperatures, electromagnetic interference and stringent industry standards.

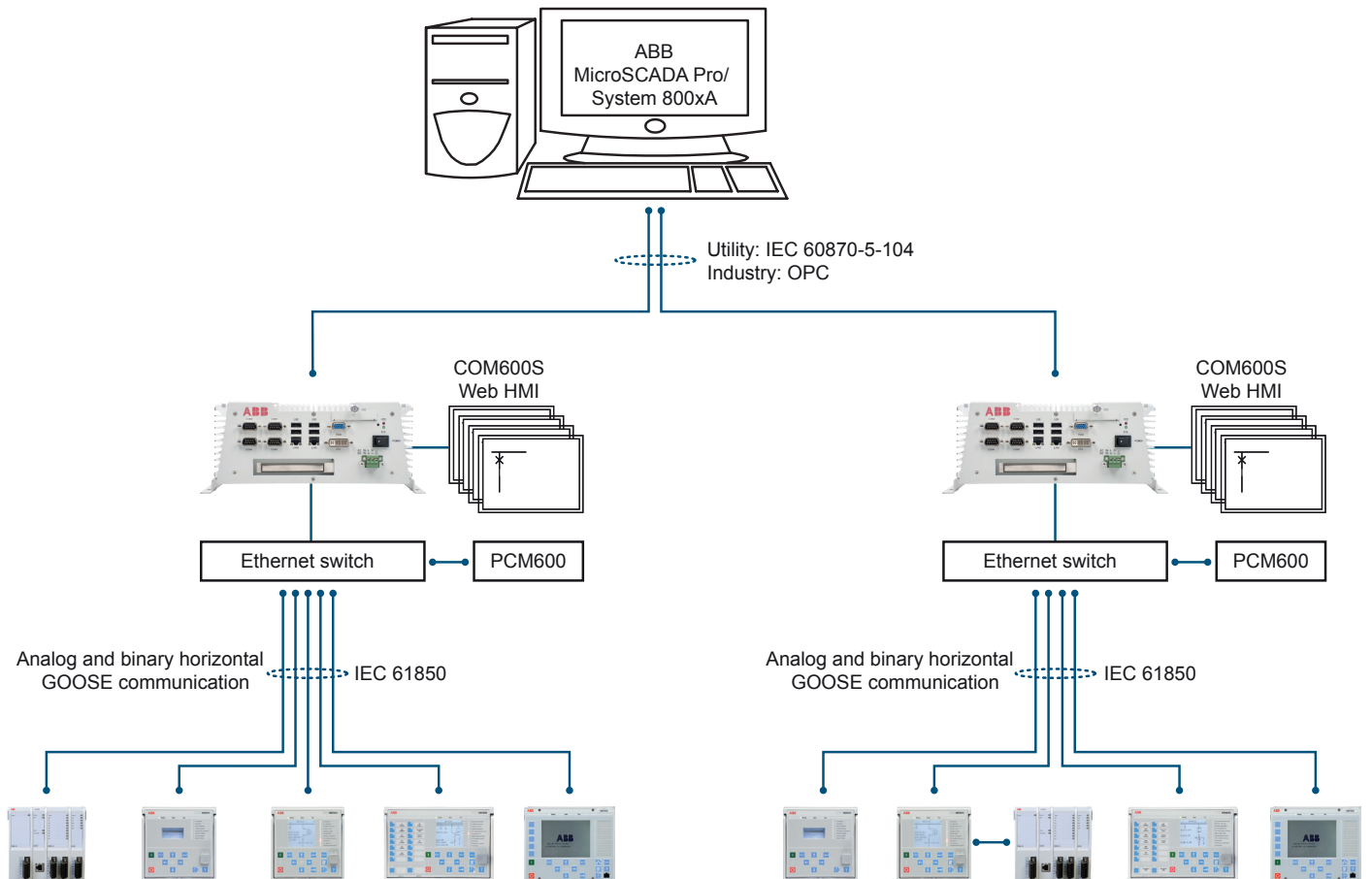


Figure 1. Connection overview of RIO600

RIO600 uses a modular architecture where the I/O control functionality is built on modules. The modules can be stacked on a standard DIN rail to achieve the required configuration.

The minimum configuration required for RIO600 contains a power supply module, a communication module and an I/O module.

Remote I/O	1MRS757487 L
RIO600	
Product version: 1.8	

Table 1. RIO600 module types

Module type		Description	
Power supply modules		PSMH	High-voltage range power supply module
		PSML	Low-voltage range power supply module
Communication modules		LECM	Communication module with Ethernet port
		LECM	Communication module with optical Ethernet port
I/O modules	Digital input module	DIM8H	High-voltage range, eight optically isolated binary inputs with common return for two inputs
		DIM8L	Low-voltage range, eight optically isolated binary inputs with common return for two inputs
	Digital output module	DOM4	Four output contacts in each digital output module with two pairs of potential free contacts with common return
	RTD module	RTD4	Four optically isolated channels supporting RTD sensors (Pt100, Pt250, Ni100, Ni120 and Ni250) and an mA input (0...20 mA configurable). Individual channels are non-isolated from each other.
	Analog output module	AOM4	Four individually isolated channels of configurable mA outputs driving 0...20 mA signals
	Sensor input module	SIM8F	Sensor input module with combined three-phase current and voltage signals
	Sensor input module	SIM4F	Sensor input module with three-phase current signals
	Smart control module	SCM8H	High-voltage range, SCM with five application types <ul style="list-style-type: none"> • 4I4O – four input and four output channels • Three-position switch • Disconnecter • Circuit breaker • Earthing switch
SCM8L		Low-voltage range, SCM with five application types <ul style="list-style-type: none"> • 4I4O – four input and four output channels • Three-position switch • Disconnecter • Circuit breaker • Earthing switch 	

The availability and combination of RIO600 modules and channels depend on the number of power supplies connected.

Table 2. Maximum number of modules and channels available when one power supply module is connected

Description	LECM with copper interface		LECM with fiber interface	
	Modules	Channels	Modules	Channels
Digital input modules (DIM8H/DIM8L)	5	40	5	40
Digital output modules	5	20	4	16
RTD4 modules	5	20	4	16
Analog output modules	2	8	1	4
SIM8F/SIM4F modules	5	-	4	-
Smart control module (SCM8H/SCM8L)	3	24	2	16