ROC800-Series Remote Operations Controllers

The ROC800 Remote Operations Controllers (ROC800) are microprocessor-based controllers that provide the functions required for a variety of field automation applications. The ROC800 monitors, measures, and controls equipment in a remote environment. The ROC800 is ideal for applications requiring flow computation; Proportional, Integral, and Derivative (PID) control loops; logic sequencing control; and up to 12 meter runs. Two versions of the ROC800 are available: the ROC809 (with nine module slots) and the ROC827 (which is expandable from three up to 27 module slots).

The ROC800 has the following features:

- Rugged, reduced-maintenance hardware.
- High isolation, surge, and short circuit protection.
- Low power consumption.
- Wide operating temperature –40 to 75 °C.
- Up to 9 (ROC809) or up to 27 (ROC827) easily installed modular I/O cards.
- Versatile serial and Ethernet communications.
- Class I, Div. 2 and Zone 2 hazardous location approval.
- Metering station support for up to 12 runs.
- Large, configurable history storage.
- Easy-to-use ROCLINK 800 configuration software.
- Custom programming with Function Sequence Tables (FSTs) or DS800 Development Suite, which allows you to build IEC 61131-3 compliant programs for use with the ROC800.

Series 2 Enhanced Architecture

Building upon the strong foundation of the ROC800, the Series 2 architecture adds significant benefits through the following advanced features:

- Increased User C memory.
- Increased CPU speed for demanding applications.
- AC I/O, APM, HART, and MVS I/O modules supported in any I/O slot.
- History database holds up to 240 points in 13 segments.

The Base Unit

The Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS) plastic housing has removable wire channel covers to protect the wiring terminals. DIN rail mounting allows the ROC800 to mount on an enclosure backplane. The rugged housing is suitable for use over the complete extended temperature range.

The ROC800 controller eliminates the need for fuses on the I/O and communications modules through the extensive use of the latest technology in short-circuit protection. This results in less maintenance for ROC800 installations.

The ROC800 economizes its power consumption for normal operation through the use of internal 3.3 volt electronics.

The ROC800 uses a power input module to convert external input power to the voltage levels required by the ROC800's electronics. Three power input modules are available for the ROC800: 12 volts dc input power, 24 volts dc input power, and 30 volts dc input power.

ROC800-Series (with 0, 1, 2, 3, and 4 expansion I/O backplanes)

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ROC809

The ROC809 houses a backplane that supports a central processing unit (CPU), a power input module, input/output (I/O) modules, and communication modules. The ROC809 has nine module slots: the first three module slots are for either communication or I/O modules, and the remaining six module slots are for I/O modules only.

ROC827

The ROC827 houses a backplane that supports a central processing unit (CPU), a power input module, and up to three modules (communications or I/O). You can expand the ROC827 by adding up to four expansion I/O backplanes. Each expansion I/O backplane has six module slots to house I/O modules. The three module slots of the base ROC827—when combined with a maximum of four expansion I/O backplanes (which contain six module slots each)—allow expansion of up to 27 module slots.

Memory

The ROC800 has four types of memory:

- Boot Flash – System initialization and diagnostics
- Flash – Firmware image
- SRAM (Static Random Access Memory) – Data Logs and configuration
- SDRAM (Synchronous Dynamic Random Access Memory) – Firmware execution and execution memory

The 32-bit microprocessor and the Real-Time Operating System (RTOS) provide both hardware and software memory protection.

Firmware

The firmware that resides in flash memory contains the operating system and application-specific software. The CPU module provides battery-backed SRAM (Static Random Access Memory) for saving the configuration, events, alarms, and historical logs.

The firmware has a database for events, alarms, and history that stores the last 450 events, the last 450 alarms, and 35 days of hourly records per API Chapter 21.1 (Second Edition, February 2013). The history database holds up to 240 points in 13 segments, providing over 224,000 unique entries. Each segment may be configured to archive at different time intervals and with different contract hours.

Meter Runs and Stations

The ROC800 optionally supports up to 12 meter runs with station support. Group similarly configured meter runs into stations. The largest benefit of using stations is in configuring and reporting. Many parameters are set once for the entire station, and reduce the work required to configure the meter runs. When reports are provided for each meter run, redundant meter run data within a station is eliminated and the need to download and upload is reduced, resulting in a more efficient reporting process.

You can group the 12 meter runs among the 12 stations in any combination. Meter runs belong in the same station if they have common parameters, such as the same contract hour and gas data. Contract hours can be set differently for each station.

Communications

The ROC800 provides up to six communication ports. Three communication ports are built-in:

- Local Operator Interface – LOI
- Ethernet – Comm1
- EIA-232 (RS-232) – Comm2

The Local Operator Interface (LOI) port's EIA-232 (RS-232D) standard RJ-45 connector provides a direct link between the ROC800 and a personal computer.

You can install up to three communication modules to provide additional ports for communicating with a host computer or other devices. The ROC800 accommodates three modules in any combination of the following types:

- EIA-232 (RS-232) for point-to-point asynchronous serial communications.
- EIA-422/EIA-485 (RS-422/RS-485) for half duplex synchronous serial communications, EIA-422 for point-to-point, EIA-485 for multiple-point, 2- and 4-wire.
- Dial-up modem for communications over a telephone network.
- The Network Radio Module (NRM) provides a wireless solution for importing and/or exporting over-the-air messages and information.

The ROC800 allows the use of a variety of communication protocols, including ROC Plus or Modbus Slave (ASCII or RTU) on all ports. In addition to these, the ROC800 allows the use of Modbus host on all ports except the LOI port.

The Ethernet port allows the following communication protocols:

- ROC Plus protocol.
- Modbus encapsulated in TCP/IP protocol (slave and host).
- Modbus TCP/IP protocol (slave and host).
- DS800 Development Suite 800 software communications.

Inputs/Outputs

The isolated I/O modules can be added to satisfy a wide variety of field I/O requirements. You can add up to nine I/O modules to the ROC809 and up to 27 I/O modules to the ROC827 with the optional expansion I/O backplanes. Optional I/O modules include:

- Analog Inputs (AI)
- Analog Outputs (AO)
- Alternating Current Inputs/Outputs (AC I/O)
- Advanced Pulse Module (APM)
- Application Module (APP)
- Discrete Inputs (DI)

- Discrete Outputs (DO)
- Discrete Output Relay (DOR)
- HART Inputs/Outputs (HART)
- IEC 62591 Interface I/O (*Wireless*HART™)
- Multi-Variable Sensor I/O (MVS I/O)
- Pulse Inputs (PI) – High or Low Speed
- RTD Inputs (RTD)
- Thermocouple I/O

Module Installation

Installation and replacement of any I/O or communication module is easily accomplished by removing the two captive screws accessible from the front of the unit. Some modules are hot-swappable, meaning you can remove the module and install another module of the same kind while under power. The new module acquires the previous module's configuration. Some modules are hot-pluggable, meaning they may be installed directly into unused module slots under power. To determine if a module is hot-swappable or hot-pluggable, refer to the specific module's product data sheet.

Software

ROCLINK 800 configuration software is an easy-to-use Windows® based application program used to configure, calibrate, monitor, and retrieve historical data from the ROC800. The ROC800 with Series 2 architecture is supported by ROCLINK 800 version 1.87 or later.

The software uses the Windows style navigation tree with drop-down menus and context-based dialog boxes. It is well organized and functional for the standard station and meter run firmware application.

ROCLINK 800 also provides program customization through Function Sequence Tables (FST). FSTs may be built from a library of functions and commands to provide special control capability, mathematical and logical operations, and database access operations.

The software provides security for controlling access to functions in ROCLINK 800 software. Passwords restrict log-on to both ROCLINK 800 and the ROC800 controller.

Options

- **CE Approval** – The ROC800 can be ordered with CE marking and complies with the European ATEX and EMC directives. For a complete list of approvals, refer to the Approvals section of the specifications table.
- **I/O and Communications** – The ROC800 supports a wide variety of I/O and communications modules to suit many applications.
- **ROC Keypad Display** – The ROC Keypad Display allows local users to view and change parameters in the ROC800.
  Note: This option is not available for CE marked units.
- **Power Input Modules** – The ROC800 unit supports 12 volt dc, 24 volt dc, and 30 volt dc power input modules, which provide 12 volt dc to the backplane.
- **License Keys** – Optional license keys are available that grant access to corresponding applications, such as DS800 Development Suite Software and gas meter run calculations.
- **Orifice and Linear Meter Calculations** – Up to 12 gas meter runs using American Gas Association (AGA) or ISO calculations for any combination of orifice, turbine, ultrasonic, and/or Coriolis meter types are enabled with optional license keys.
- **Development Suite 800 (IEC 61131-3)** – DS800 Development Suite Software is an integrated development environment allowing you to build IEC 61131-3 compliant programs. The DS800 software can be used to develop programs independent of ROCLINK 800 Configuration Software and is enabled with an optional license key. For more information, refer to *Product Data Sheet DS800*.

ROC800 Remote Operations Controller

CPU Module		
Processor		32-bit microprocessor based on the Motorola MPC862 Quad Integrated Communications Controller (PowerQUICC™) PowerPC processor running at 65 MHz
Memory	Boot Flash	256 KB for system initialization and diagnostics
	Flash	16 MB for firmware image and report files
	SRAM	2 MB for historical data logs and configuration
	Synchronous DRAM	32 MB for firmware execution and execution memory
Battery Backup	Type	Sanyo 3 V CR2430 lithium, user-replaceable
	Normal use life	10 years (while power is applied to unit)
	Backup life	1 year minimum while maintaining RTC and SRAM data and no power is applied to unit
	Shelf life	10 years (with backup battery jumper removed)
Clock	Type	32 KHz crystal oscillator with regulated supply, battery-backed. Year/Month/Day and Hour/Minute/Second
	Clock Accuracy	0.01%
	Watchdog Timer	Hardware monitor expires after 3 seconds and resets the processor
Diagnostics	Board Temperature Accuracy	1% typical, 2% maximum
	Voltage Monitor Accuracy	0.75% typical, 1% maximum
Light-Emitting Diodes (LEDs)	Status	Indicates normal function, low battery voltage, and firmware status.
	COL (Ethernet)	Indicates that packet collisions occurred when transmitting or receiving data through the Ethernet port
	ACT (Ethernet)	Indicates that the ROC800 is transmitting or receiving data through the Ethernet port
	DTR (RS-232)	Data Terminal Ready
	RTS (RS-232)	Request to Send
	Tx (RS-232)	Indicates that the ROC800 is transmitting data through an EIA-232 (RS-232) communication port
	Rx (RS-232)	Indicates that the ROC800 is receiving data through an EIA-232 (RS-232) communication port
Communications		
Ports on CPU module	LOI (Local Operator Interface)	EIA-232D (RS-232D) Standard. 115.2K bps maximum data rate
	Ethernet	10BASE-T twisted pair. IEEE multi-segment 10 MB/second baseband Ethernet

	Maximum Segment	100 m (330 ft)
	EIA-232 (RS-232) Port	Single. 115.2K bps maximum data rate
Communication Modules (optional)	EIA-232 (RS232)	Single. 115.2K bps maximum data rate. For more information, refer to *Product Data Sheet ROC800:COM*.
	EIA-422/485 (RS-422/485)	Single. 115.2K bps maximum data rate. For more information, refer to *Product Data Sheet ROC800:COM*.
	Dial-up Modem	Single. 14.4K bps maximum data rate. For more information, refer to *Product Data Sheet ROC800:COM*.
	Network Radio Module	Provides a wireless solution for importing and/or exporting over-the-air messages and information. For more information, refer to *Product Data Sheet ROC800:NRM*
Protocols	LOI Port	ROC Plus, Modbus slave (ASCII or RTU), DS800 Development Suite 800 software communications
	EIA-232 and EIA-422/485	ROC Plus, Modbus host and slave (ASCII or RTU), DS800 Development Suite 800 software communications
	Ethernet	ROC Plus, Modbus host and slave (ASCII or RTU) encapsulated in TCP/IP or via TCP/IP, DS800 Development Suite 800 software communications **Note:** The Ethernet port supports up to six ROC Plus connections, six Modbus Slave connections, and one Modbus Master connection **all** at the same time.
	Dial-up Modem	ROC Plus, Modbus slave (ASCII or RTU)

Input/Output Modules (optional)

Alternating Current Input/Output	6 channels, selectable as input or output. For more information, refer to *Product Data Sheet ROC800:ACIO*.
Analog Input-12	4 channels, 12-bit resolution. For more information, refer to *Product Data Sheet ROC800:AI*.
Analog Input-16	4 channels, 16-bit resolution. For more information, refer to *Product Data Sheet ROC800:AI*.
Analog Output	4 channels. For more information, refer to *Product Data Sheet ROC800:AO*.
Advanced Pulse Module	4 channels. For more information, refer to *Product Data Sheet ROC800:APM*.
Application Module	Provides a way to add programs to the ROC800 by simply installing the module that includes all point types and screens that are part of the application. This module which has RS-485 communications port, is preloaded with a specific application. For more information, refer to *Product Data Sheet ROC800:APP*.
Discrete Input	8 channels. For more information, refer to *Product Data Sheet ROC800:DI*.
Discrete Output	5 channels. For more information, refer to *Product Data Sheet ROC800:DO*.
Discrete Output Relay	5 channels. For more information, refer to *Product Data Sheet ROC800:DOR*.
HART Input/Output	4 channels, each capable of communications with up to 5 HART devices (when in input multi-drop mode). For more information, refer to *Product Data Sheet ROC800:HART2*.
IEC 62591 Interface Module	Supports up to 20 *Wireless*HART field devices. Provides both process variables and diagnostic data to the ROC800 and supports HART Pass-Through to AMS Device Manager. For more information, refer to *Product Data Sheet ROC800:62591*.
MVS Input/Output	Supports up to 6 sensors. For more information, refer to *Product Data Sheet ROC800:MVS*.

Pulse Input	2 channels, user-selectable high speed or low speed per channel. For more information, refer to *Product Data Sheet ROC800:PI*.			
RTD Input	2 channels. For more information, refer to *Product Data Sheet ROC800:RTD*.			
Thermocouple Input/Output	4 channels. For more information, refer to *Product Data Sheet ROC800:TC2*.			

Power

ROC809 Input Power	Series 2 Base Unit (power module, backplane, and CPU)	12 Vdc Power Input Module (PM-12)	88 mA
		24 Vdc Power Input Module (PM-24)	102 mA
		30 Vdc Power Input Module (PM-30)	99 mA
ROC827 Input Power	Series 2 Base Unit (power module, backplane, and CPU)	12 Vdc Power Input Module (PM-12)	104 mA
		24 Vdc Power Input Module (PM-24)	110 mA
		30 Vdc Power Input Module (PM-30)	115 mA
	Series 2 Expansion I/O Backplane	12 Vdc Power Input Module (PM-12)	25 mA
		24 Vdc Power Input Module (PM-24)	12.5 mA
		30 Vdc Power Input Module (PM-30)	17 mA

Notes:

- To determine the unit's final input power requirements, add the input power requirements of the base unit, any optional expansion I/O backplanes, and all appropriate communication or I/O modules together. Input power requirements for individual modules are listed on each module's product data sheet.
- For more information on the Power Input modules, refer to *Product Data Sheet ROC800:PWR*.

Physical

Dimensions	ROC809	241 mm H by 244 mm W by 174 mm D (9.5 in. H by 9.6 in. W by 6.85 in. D). Allow an addition depth of 19 mm (0.75 in.) for cables.		
	ROC827	Width	Each End Cap	27.1 mm (1.07 in.)
			Base Unit	93.2 mm (3.67 in.)
			Expansion I/O Backplane	93.2 mm (3.67 in.)
		Height	241 mm (9.5 in.)	
		Depth	174 mm (6.85 in.). Allow an additional 19 mm (0.75 in.) for cables	
		Note:	To determine the unit's final width, add the widths of a base backplane, a left end cap, a right end cap, and the appropriate number of expansion I/O backplanes (up to four).	
Weight	ROC809	1.65 kg (3.65 lb) for housing, backplane, and CPU.		

		Note:	To determine the unit's final weight, add the weight of the ROC809, and the appropriate number of I/O and communications modules. Weights for individual modules are listed on each module's product data sheet.
	ROC827	Each End Cap	160 g (5.6 oz)
		Base Unit (with CPU)	770 g (1 lb. 11 oz)
		Expansion I/O Backplane	517 g (1 lb 2 oz)
		Note:	To determine the unit's final weight, add the weight of the ROC827 base unit, a left end cap, a right end cap, the appropriate number of expansion I/O backplanes (up to four), and the appropriate number of I/O and communications modules. Weights for individual modules are listed on each module's product data sheet.
Wiring	Size 12 to 22 American Wire Gauge (AWG) for terminal blocks.		
Materials	Housing	Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS) Plastic	
	Wire Channel Covers	Polypropylene Plastic	
	Modules	Thermoplastic Polyester, solvent-resistant	
Housing	US Government Patent	6771513	
Mounting	DIN Rail	Size 35	
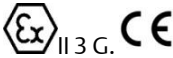
Environmental

Operating Temp	–40 to 75 °C (–40 to 167 °F)
Storage Temp	–40 to 85 °C (–40 to 185 °F)
Operating Humidity	IEC68-2-3; 5-95% non-condensing
Radiated Emissions	Meets EN 55011 Class A; ICES-003:1997 Digital Apparatus; and FCC Part 15, Class A
Mechanical Shock	IEC68-2-27; 11 ms, sinusoidal 50 Gs non-operating, 15 Gs operating
Thermal Shock	IEC68-2-14; Air to air from –20 to 85 °C (–4 to 185 °F)
Radiated/Conducted Immunity	Meets requirements of IEC 61326 Electrical Equipment for use in Industrial Locations
Vibration	IEC68-2-6; 0.15 mm or 20m/s^2

Approvals

Product Markings for Hazardous Locations	CSA C/US	Certified by CSA as Model W40134 Class I, Division 2, Groups A, B, C, and D, T4 Class I, Zone 2, Group IIC T4

Evaluated per Approval Standards	C22.2 No. 0 M1991 C22.2 No. 0.4 M2004 C22.2 No. 142 M1987 C22.2 No. 213 M1987 CAN/CSA E60079-0-02 CAN/CSA E60079-15-02 UL 508 – 17th Edition UL 1604 – 3rd Edition UL 60079-0-02 UL 60079-15-02
CE Marked (optional)	Certified by Sira as Model W40135. ATEX Cert Sira 05ATEX4046X Product Markings for Hazardous Locations: EEx nA IIC T4, T_{amb} = −40 °C to +75 °C ⟨Ex⟩ II 3 G. C E
Evaluated per Approval Standards	ATEX: EN 50014 (1997+A1+A2) EN 60079-15 (2003) EMC: EN 61326:2003 Immunity and Class A Emissions EN 61000-4-2 (Electrostatic Discharge) EN 61000-4-3 (Radiated Immunity) EN 61000-4-4 (Fast Transients) EN 61000-4-5 (Surges) EN 61000-4-6 (Conducted RF) EN 55011:2002 IECEx: IEC 60079-0:2011 (6th Edition) IEC 60079-15:2010, 4th Edition
Australian C-Tick	Certified as Model W40135
TR CU 012/2011	Certified by NANIO "CCVE" RU C-US.ГБ05.В.01094 valid from 17.04.2015 to 17.04.2020 2Ex nA IIC T4 X -40C^0≤Ta≤+75C^0 IP54 Ex

Miscellaneous Approvals	INMETRO	Approved by INMETRO as Model W40135 NCC 12.1098 X Ex nA IIC T4 Gc (-40°C ≤ Tamb ≤ 75°C)
	Spectrum Approval for the Network Radio Module	USA, Canada, Australia, New Zealand
	China	Pattern Approval No. 2004-F303

Customs Union	**EAC**
	TR CU 004/2011, TR CU 020/2011 Certified by "Technoneftegaz" TC RU C-US.HO03.B.00305 valid from 30.06.2015 to 29.06.2020
GOST	Pattern Approval No. 31629
Uzbekistan	Type Approval No. 02.3262
RoHS2	RoHS (2) EU Directive 2011/65/EU: This product may be considered out-of-scope when used for the intended design purpose in a Large Scale Fixed Installation (LSFI). Consult https://www.emerson.com/compliance for up-to-date product information.
RoHS (China)	

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