ROC800L Remote Operations Controller

The ROC800L Remote Operations Controller (ROC800L) is a microprocessor-based controller that provides the functions required for a variety of field automation applications, including liquid measurement. The ROC800L monitors, measures, and controls equipment in a plant or remote environment. The ROC800L is ideal for any application requiring flow computation; Proportional, Integral, and Derivative (PID) control loops; logic sequencing control; and up to six liquid meter runs. Two versions of the ROC800L are available: the ROC809L (with nine module slots) and the ROC827L (which is expandable from three to 27 module slots).

Factory installed liquid measurement user programs provide the American Petroleum Institute (API) calculations in accordance with Manual for Petroleum Measurement Systems (MPMS). The liquid measurement user programs perform the following functions:

- Liquid Calculations – Accurately measures liquids flowing through a meter, and performs volume corrections based on density, temperature, and pressure measurements.
- Batching – Allows you to configure and schedule multiple batches to record and control the flow of a liquid. Batch accuracy is improved through the retroactive calculation and re-calculation using user-defined variables.
- Proving – Performs meter proving by operating a 4-way control valve, calculating a new meter factor, and storing meter factor information on up to 24 products for each of up to six meters. Unidirectional, bidirectional, large volume, small volume, and master meter proving are supported. A prover densitometer is also supported for inferred mass proving.
- Reporting – Generates printable reports in compliance with API MPMS Chapter 12.2.2, 12.2.3, and 21.2. User-designed reports can be created using ROCLINK™ 800 Configuration Software.

For additional information on each of the included programs, refer to *Product Data Sheet ROC800:SW1*.

The ROC800L has the following features:

- Rugged, reduced-maintenance hardware.
- High isolation, surge and short circuit protection.
- Low power consumption.
- Wide operation temperature (–40 to 75°C).
- Up to 27 easily installed modular I/O cards.
- Versatile serial and Ethernet communications.
- Class I, Div. 2 & Zone 2 hazardous location approval.
- Metering station support for up to 6 liquid runs and ability to support up to 6 gas runs with an optional AGA license key installed.
- 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 ROC800L.

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 ROC800L to mount on an enclosure backplane. The rugged housing is suitable for use over the complete extended temperature range.

The ROC800L 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.

The ROC800L economizes its power consumption for normal operation through the use of internal 3.3 volt electronics.

The ROC800L uses a power input module to convert external input power to the voltage levels required by the ROC800L's electronics. Two power input modules are available for the ROC800L: one for 12 volt dc input power and one for 24 volt dc input power.

ROC827L (with 0, 1, 2, 3, and 4 expansion I/O backplanes)

EMERSON.

ROC809L

The ROC809L houses a backplane that supports a ROC800-Series 2 central processing unit (CPU), a power input module, Input/Output (I/O) modules, and communication modules. The ROC809L has nine slots for modules: the first three slots are for either communication or I/O modules, and the remaining six slots are for I/O modules only.

ROC827L

The ROC827L houses a backplane that supports a ROC800-Series 2 central processing unit (CPU), a power input module, and up to three modules (communications or I/O). You can expand the ROC827L by adding up to four expansion I/O backplanes. Each expansion I/O backplane has six slots to house I/O modules. The three module slots of the base ROC827L—when combined with a maximum of four expansion I/O backplanes (which contain six slots each)—allow expansion of up to 27 slots.

Memory

The ROC800L has four types of memory:

- **Boot Flash** – System initialization and diagnostics.
- **Flash** – Firmware image and report files.
- **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 resides in flash memory and contains the operating system and application 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. The weights and measures database stores up to 1000 weights and measures events. The history database holds up to 240 points in 13 segments, providing over 224,000 unique entries. You can configure each segment to archive at different time intervals and with different contract hours.

Meter Runs and Stations

The ROC800L supports up to six liquid meter runs and up to six stations. You can group meter runs and stations in any combination. Typically, you associate meter runs with a station if the meter runs have common parameters, such as fluid type and base temperature.

Grouping similarly configured meter runs with stations provides significant benefits in batching, configuration, and reporting. For example, you can configure parameters at the station level. The system then applies those configuration parameters to all meters belonging to the station, reducing configuration time.

You can configure the ROC800L either to provide individual reports for each meter or to generate station reports that consolidate multiple meters. Station reports eliminate redundant meter run data, reduce the need to download and upload, and result in a more efficient reporting process.

Communications

The ROC800L 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 ROC800L 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 ROC800L 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 asynchronous 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 ROC800L 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 ROC800L allows the use of Modbus host on all ports except the LOI and Ethernet ports.

The Ethernet port allows the following communication protocols:

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

Input/Output Options

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 ROC809L and up to 27 modules to the ROC827L with the optional expansion I/O backplanes. I/O modules include:

- Analog Inputs (AI)
- Analog Outputs (AO)
- Alternating Current Inputs/Outputs (AC I/O)
- Advanced Pulse Module (APM)
- Discrete Inputs (DI)
- Discrete Outputs (DO)
- Discrete Output Relay (DOR)
- HART Inputs/Outputs (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 ROC800L. The ROC800L is supported by ROCLINK 800 version 1.88 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 (FSTs). 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 ROC800L controller.

Options

- I/O and Communications – The ROC800L 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 ROC800L.
- Power Input Modules – The ROC800L unit supports 12 volt dc or 24 volt dc power input modules, which provide 12 volt dc power 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 six 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 an optional license key. This allows the ROC800L to measure up to six gas meter runs simultaneously with the liquid meter runs.
- 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*.

Compatibility

The ROC800L uses a ROC800-Series 2 CPU and Series 2-compatible modules. For module compatibility questions, refer to the individual module's product data sheet.

ROC800L 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
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, system AI alarm, and firmware status.
	COL (Ethernet)	Indicates that packet collisions occurred when transmitting or receiving data through the Ethernet port
	ACT (Ethernet)	Indicates that the ROC800L 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 ROC800L is transmitting data through an EIA-232 (RS-232) communication port
	Rx (RS-232)	Indicates that the ROC800L 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. 115.2 Kbps 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. 115.2 Kbps maximum data rate
Communication Modules (optional)	EIA-232 (RS232)	Single. 115.2 Kbps maximum data rate. For more information, refer to *Product Data Sheet ROC800:COM*.
	EIA-422/485 (RS-422/485)	Single. 115.2 Kbps maximum data rate. For more information, refer to *Product Data Sheet ROC800:COM*.
	Dial-up Modem Module	Single. 14.4 Kbps 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 Port	ROC Plus, Modbus host and slave (ASCII or RTU) encapsulated in TCP/IP or via TCP/IP, DS800 Development Suite 800 software communications
	Dial-up Modem	ROC Plus, Modbus slave (ASCII or RTU)

Inputs/Outputs 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 bits of resolution. For more information, refer to *Product Data Sheet ROC800:AI*.
Analog Input-16	4 channels; 16 bits of 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 Input	4 channels pulse, 2 prover. For more information, refer to *Product Data Sheet ROC800:APM*.
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:HART*.
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			
ROC809L Input Power	Series 2 Base Unit (power module, backplane, and CPU)	12 Vdc Power Input Module (PM-12)	88 mA. For more information, refer to *Product Data Sheet ROC800:PIM*.
		24 Vdc Power Input Module (PM-24)	102 mA. For more information, refer to *Product Data Sheet ROC800:PIM*.
ROC827L Input Power	Series 2 Base Unit (power module, backplane, and CPU)	12 Vdc Power Input Module (PM-12)	104 mA. For more information, refer to *Product Data Sheet ROC800:PIM*.
		24 Vdc Power Input Module (PM-24)	110 mA. For more information, refer to *Product Data Sheet ROC800:PIM*.
ROC827L Input Power (continued)	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

Note: 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.

Physical				
Dimensions	ROC809L	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.		
	ROC827L	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	ROC809L	1.65 kg (3.65 lb) for housing, backplane, and CPU.		
		Note:	To determine the unit's final weight, add the weight of the ROC809L, and the appropriate number of I/O and communications modules. Weights for individual modules are listed on each module's product data sheet.	
	ROC827L	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 ROC827L 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 as Model W40134 Class I, Division 2, Groups A, B, C, and D, T4 Class I, Zone 2, Group IIC, T4 AEx nA IIC, T4
Approval Standards	CSA/UL Standards	CSA C22.2 No. 142 and No. 213 CAN/CSA E79-0-02 and E79-15-02 UL 1604 – 3rd Edition UL 508 – 17th Edition
	EMC Standards	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

Miscellaneous Approvals	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)	

For customer service and technical support,
visit *www.Emerson.com/SupportNet*

Global Headquarters,
North America, and Latin America:
  Emerson Process Management
  Remote Automation Solutions
  6005 Rogerdale Road
  Houston, TX 77072 U.S.A.
  T +1 281 879 2699 | F +1 281 988 4445
  www.Emerson.com/RemoteAutomation

Europe:
  Emerson Process Management
  Remote Automation Solutions
  Unit 1, Waterfront Business Park
  Dudley Road, Brierley Hill
  Dudley DY5 1LX UK
  T +44 1384 487200 | F +44 1384 487258

Middle East/Africa:
  Emerson Process Management
  Remote Automation Solutions
  Emerson FZE
  P.O. Box 17033
  Jebel Ali Free Zone – South 2
  Dubai U.A.E.
  T +971 4 8118100 | F +971 4 8865465

Asia-Pacific:
  Emerson Process Management
  Remote Automation Solutions
  1 Pandan Crescent
  Singapore 128461
  T +65 6777 8211| F +65 6777 0947

Remote Automation Solutions

EMERSON.