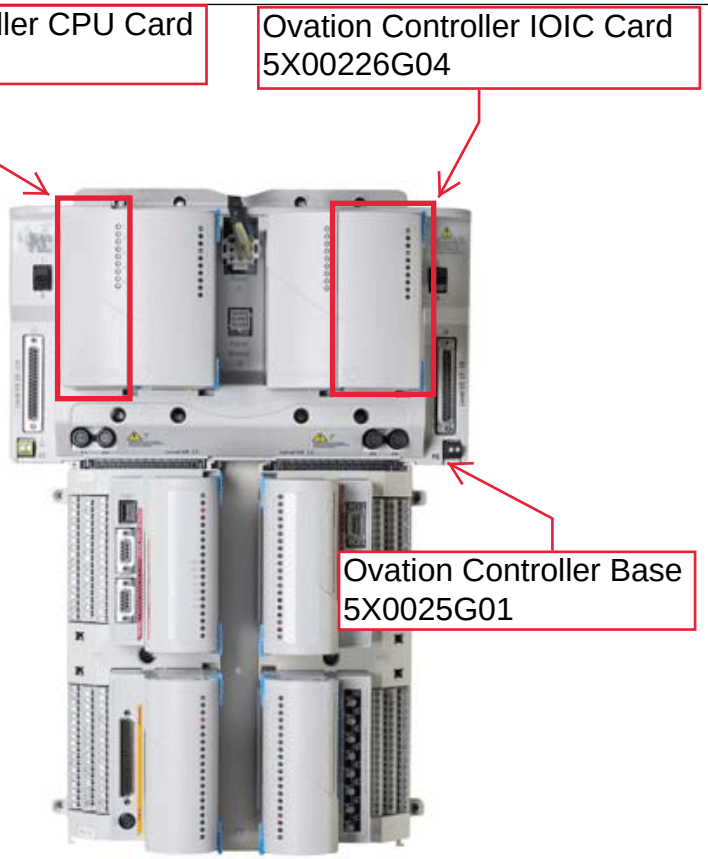
Ovation™ Controller Model OCR1100

(5X00481G04/5X00226G04)

Features

- Secure, reliable and mission-critical control capability providing “bumpless” automatic failover between redundant controllers.
- Fast processor for increased productivity
- One-step data acquisition functionality through the definition of the I/O database
- Small footprint with low power requirements and fanless operation
- Interfaces to Ovation and WDPF I/O, both local and remote
- Integral interface to digital busses through Ovation I/O modules
- Integrated virtual I/O capability for third-party OEM systems over Ethernet protocols.
- Non-volatile storage of application software, point database, configuration information, and operating tuning constants
- Integrated sequence of events capability with 1 millisecond resolution
- Meets IEC 61131-3 standards
- Achilles Level 1 certified



Redundant Ovation controller model OCR1100 shown with four local Ovation I/O modules installed on two I/O branches.

Introduction

Emerson’s Ovation™ distributed control system is renowned for delivering precision control with outstanding performance. That precision begins with the Ovation controller secure, mission-critical operations such as those of power generation, water and wastewater plants.

The OCR1100 model of the Ovation controller series executes simple or complex modulating and sequential control strategies, performs data acquisition functions and interfaces to the Ovation network and various I/O sub-systems. It has the capability to originate up to 32,000 points.

Process Applications

The Ovation OCR1100 controller is designed to meet the demanding requirements of a wide range of process applications. Functions performed by the controller include:

- Continuous (PID) control
- Boolean logic
- Advanced control
- Special logic and timing functions
- Data acquisition
- Sequence of events processing
- Cold junction compensation

- Process point sensor/limit checking
- Process point alarm processing
- Process point conversion to engineering units
- Process point database storage
- Local and remote I/O interface
- Process point tagout

Standard Functions

Control Execution

The Ovation OCR1100 controller, with an Intel®-based processor, is capable of simultaneously executing as many as five process control tasks at loop speeds ranging from 10 milliseconds to 30 seconds. Each control task is comprised of the I/O process point input scan, control scheme execution and an output scan. Two of the control tasks use predefined loops speeds of one-second and 100 milliseconds. The other three control tasks can have user-selectable loop speeds. Individual control sheets assigned to an available task coordinate the control execution loop time with the appropriate control function. Advanced diagnostics visible on Ovation HMI graphics indicate control task loop times for configured, average, worst case and standard deviation.

Control Scheme

OCR1100 functionality is defined by control sheets created from an extensive library of standard and advanced Ovation algorithms specifically designed for the power, water and wastewater industries. Control sheets provide the basis for executing, documenting and automatically creating control tuning diagrams used during commissioning and when adjusting control schemes. On average, the OCC100 controller can execute more than 1,000 control sheets.

Sequence-of-Events

Integral sequence-of-events processing capability is provided using Ovation I/O and standard controller software. With a resolution of one millisecond, the sequence-of-events subsystem records the sequence in which a set of user-defined digital input indications change state, providing a valuable troubleshooting and diagnostic tool for high-speed electrical systems.

In addition to the higher resolution time tags, sequence-of-events points may be used in control schemes like any other I/O point, including limit checking and alarming.

Alarm Processing

The OCR1100 processes limits and alarms based on each process point's database definition. These functions are performed regardless of whether the point is scanned for input to a control loop or for data acquisition separate from control functions. The alarm status of each point in the controller is updated with each scan. The status may indicate whether a point value has:

- Exceeded the range of the sensor
- Exceeded the user-defined limits
- Changed state
- Passed an incremental limit

Alarm reporting can be delayed on a per-point basis by a user-specified period.

When coupled with a workstation, the Ovation OCR1100 controller has the capability to report six independent alarm thresholds defined as:

- Four high limits
- User-defined high limit
- Highest plus incremental limits
- Four low limits
- User-defined low limit
- Lowest plus incremental limits

The workstation can sort and display alarms based on a user-selected alarm significance level.

Operator Interface Processing

The Ovation controller performs all limit and alarm processing based on the database configuration for each point. However, Ovation HMI's provide the capability to suspend these functions, as necessary, based on the process state or operator actions.

Controller Types

Ovation controller capabilities can be expanded with add-on software licenses for simulation, virtual control or advanced control.

The simulator controller is a standard controller that uses simulated I/O (instead of the actual hardware I/O system) to interface control schemes with a process model or simulation. The simulator controller can be used in a basic factory acceptance test process model or with high-fidelity process plant models.

An advanced controller executes licensed algorithms with advanced functionality such as auto regressive, dynamic matrix, device, sootblowing, fuzzy logic, sequencing, programmable block and temperature profile.

The virtual controller is a software-licensed capability which recreates the Ovation hardware controller with a real-time operating system on a Windows-based platform. It is used primarily in Ovation simulation solutions with non-redundant virtual controllers to decrease the hardware footprint. The virtual controller has most of the interface attributes of a standard, simulation or advanced controller except for hardware I/O support.

Redundancy

The OCR1100 controller is designed to accommodate multiple levels of redundancy for key components, including:

- Ovation network interface
- Functional processor, memory, and network controller
- Processor power supply
- I/O interfaces
- Input power feed
- I/O power supply
- Auxiliary power supply
- Remote I/O communications media

The standard hardware configuration for controller redundancy is a passive backplane base on which both a primary and a backup controller are installed.

Redundant 24V power is connected to the unit which is individually distributed to the controllers. Each controller consists of two modules. One module provides the processor, memory, Ovation networking and additional networking connections. The other module provides the interface to both local and remote Ovation and Q Line I/O, plus internal powering.

Each functional processor in the redundant pair executes the same application program, although only one accesses the I/O and operates in control mode at a time. The partner processor runs in backup, configure or off-line modes with differences between them alarmed.

Control Mode

In control mode, the primary processor has direct I/O access to read, write and execute both data acquisition and control functions. In addition, the primary processor monitors the status and health of its backup partner's processor and network.

Backup Mode

In backup mode, the backup processor performs diagnostics and monitors the status and health of the primary processor. The backup processor maintains up-to-date data by polling the control processor's database memory and receiving all of the information that the control processor sends including process point values, algorithm tuning constants and variable point attributes.

Automatic Failover Control

The redundancy function of the Ovation OCR1100 controller is equipped with automatic failover control. If the processor in control mode fails, watchdog detection circuitry disables the I/O interface of the primary processor and informs the backup processor of the failure. The backup processor instantaneously begins to execute the process control application program and broadcast information over the Ovation network.

Ovation controllers use a continual process of control memory updating to keep both the control and backup processors synchronized. This allows the algorithms to track the output values, pass the information upstream and apply the data during the first pass of execution. The result is a bumpless failover, even in the case of a

malfunction. A full range of events can trigger automatic failover, including:

- Control processor failure
- Network controller failure
- I/O interface failure
- Removal of power from the control processor
- Control processor reset

Once control is passed to the backup processor, the failed processor may be powered down, repaired and powered back up with no harmful effects on the executing control strategy.

Upon restart, the repaired processor will detect that its partner is in control and assume the backup role. The processor in control will detect the presence of the backup processor and adjust for redundant operation.

Data Pass-Through

The OCR1100 controller is equipped with the ability to pass smart field device information to any workstation on the Ovation network. Users can take advantage of asset management solutions, such as Emerson's AMS Suite, for remote management of intelligent field devices.

Open Architecture

The Ovation OCR1100 controller's open architecture uses a powerful real-time operating system running a CompactPCI® i-bus PC design. This configuration allows rapidly advancing technology to be easily integrated into the control system while protecting software investments.

Real-Time Operating System Functions

The OCR1100 controller processes data for real-time control and communication functions using a commercially available, multi-tasking, real-time operating system. It executes and coordinates the control of multiple application areas by using multi-tasking with preemptive priority scheduling. The real-time operating system communicates with the Ovation network and other systems via the TCP/IP protocol, provides some basic routing functions and offers general resource management within the controller.

Hardware

The Ovation OCR1100 controller is built to open industry standards using Intel processors and CompactPCI bus technology. Newer technologies can be easily incorporated while protecting the initial Ovation controller software investment.

This foundation provides the portability such that Ovation controller software can be run on other available platforms and operating systems. The Ovation virtual controller used in Ovation simulator systems runs the standard Windows operating system on standard PC hardware and does not require actual I/O interfaces.

The hardware platform and the operating systems for the Ovation controller, based on industry standards, offer the following advantages:

- Minimal cost and complexity of hardware and software upgrades
- Increased ability to track advances in technology

Specifications

The Ovation controller hardware platform has evolved over time beginning with the OCR161 model.

Specifications for the OCR1100 model are detailed in the tables within this document. The OCR1100 controller model shares the same packaging concept as the preceding OCR400 model. Migration programs are available to update previous model control logic and databases to the latest model.

OCR1100 platform provides backward hardware compatibility and can be used as an OCR400 while retaining the ability to provide full OCR1100 capabilities when installed in an Ovation system release which supports them (i.e. Ovation 3.5 and above).

I/O Capabilities

The Ovation controller supports the concurrent use of several I/O systems depending upon the model used.

Like the controller, the I/O system continues to evolve, including support for increased channel capacity modules. Refer to the controller hardware manual and the I/O reference manual for additional details on the available models, capacities, module capabilities and termination types.

Ovation Controller Cabinets

Ovation controllers and I/O modules are all DIN rail mountable, providing the flexibility to match controller layouts with process requirements for various locations, environments and space availability. The normal configuration is to mount DIN rail items on plates which can then be installed in existing or new cabinet enclosures. Top and bottom entry for I/O cables is available to meet required specifications.

A variety of controller and I/O cabinet configurations are available. The basic controller cabinet houses a chassis for single or redundant controllers and two I/O branches on the front of the plate. Mounted on the rear of the plate is a redundant power supply, power distribution module and two additional I/O branches for a total of 32 I/O modules since each I/O branch can hold up to eight I/O modules.

Expansion cabinets house up to an additional 32 I/O modules in four branches and a transition panel for connection to the controllers. It can also provide additional space for mounting redundant power supplies (when required), and a power distribution module.

Ovation's standard cabinet structure is front and rear access, but can be provided with front access only. Other custom or OEM cabinet enclosures are optionally available to accommodate specific requirements for plate sizes, cabinet sizes, construction materials, environmental ratings, cabinet interior and exterior accessories, termination options and marshaling cabinets.

IEC 61131-3 Compliant

The International Electrotechnical Committee of the ISO organization created a set of standards to achieve uniform mechanisms to configure and program control systems from different vendors. Part 3 of the IEC 61131 directly relates to the standard programming languages recommended to conform to this standard.

The IEC 61131 standard specifies the syntax and semantics of a unified suite of programming languages, including the software model and a structuring language. The standard can be summarized and described under two main categories: Common Elements and Programming Languages. Refer to the Ovation Compliance to IEC 61131-3 data sheet for detailed information Ovation's adherence to this international standard.

Achilles Certified

Achilles® Communications Certification provides an industry-leading benchmark for the secure development of the applications, devices and systems found in critical infrastructure. The certification process is designed to assess the network robustness of industrial devices and certify that they meet a comprehensive set of requirements. It provides device manufacturers with an independently verified result to communicate their product security to customers, while providing the operators of control systems with the most complete, accurate and trustworthy information possible about the network resilience of their deployed products.

The Ovation OCR1100 controller complies with the requirements set forth by Achilles Level 1 certification.

Summary

The Ovation system is renowned for delivering precision control with outstanding performance. That precision begins with the Ovation controller that provides full-redundancy to assure the reliability and security necessary for even the most demanding application. The Ovation controller executes simple or complex modulating and sequential control strategies, performing data acquisition functions and incorporating full bumpless redundancy for mission critical applications. The controller provides the capabilities to control a variety of applications in an adaptable, flexible and cost-effective manner. With industry-standard hardware and software platforms, the controller is easy to upgrade throughout a plant lifecycle. These features make the Ovation controller one of the most powerful in the industry.

Ovation Controller Specifications

Ovation Controller Model OCR 1100 - Specifications		
Item	**Capability**	
Bus structure	CompactPCI standard	
Originated points	Up to 32,000 points	
Process control tasks	Up to 5 each with a different loop execution rate	
Control task loop execution time	Two of the 5 tasks are predefined @ 1 s and @ 100 ms. The other three tasks are user definable, with each task individually defined to execute at a rate between 10 ms. and 30 seconds in increments of 10 ms.	
Processor base frequency	1.1 GHz	
Memory	1 Gb Flash & 256 Mb RAM	
NIC ports	4 x 10/100 Mb Ethernet Two options: (i) 4 x RJ45 or (ii) 1 x RJ45 + 3 SFP Fiber	
Temperature	Ambient: 0-60 ºC or 32-140 º F (i) 4 x RJ45	Ambient: 0-50 ºC or 32-122 º F (ii) 1 x RJ45 + 3SP Fiber
Power	24 VDC 40W	
Humidity	0 - 95% RH	
Size	20” w x 8” h x 7” d	
CE Mark	Certified to be CE Mark when installed in a CE Mark cabinet	
BootROM	OCR1100 only OCR400 replacement / OCR1100	
Achilles Level 1 certification	Model No. OCR1100 Category Embedded Device	

Ovation Controller Model OCR 1100 - I/O Specifications		
Item	**Capability**	
Local Ovation I/O	Up to 16 independent branches of 8 modules per branch for a total of 128 I/O modules	
Local Q-Line I/O	1 node of 48 Q-line I/O cards	
*Extended Q-Line I/O	1 additional node of 48 Q-line I/O cards	
Remote Node Interface	Up to 16 remote node interface modules where each remote node interface can support up to 64 I/O modules	
*Remote Ovation I/O	Up to 8 nodes where each node can support up to 64 I/O modules	
*Remote Q-Line I/O	Up to 8 nodes of 48 Q-line I/O cards	
Smart device capability	Foundation™ fieldbus / PROFIBUS / DeviceNet	
Virtual I/O capability via Ethernet TCP/IP and standard protocols	Allen-Bradley PLCs DF-1 GE Mark V/VI GSM Modbus/TCP	MHI turbine control External Ovation network GE Genius I/O Toshiba turbine control

**Any one of these I/O types can be supported at one time.*

Ovation Controller Model OCR1100 - Cabinet Specifications		
Item	**Standard Controller Cabinet**	**Expansion Cabinet**
Size	(h x w x d) 79 x 24 x 24 in 2006.6 x 609.6 x 609.6 mm	(h x w x d) 79 x 24 x 24 in 2006.6 x 609.6 x 609.6 mm
Weight (fully configured)	426.25 lbs. 191.81 kg.	396.25 lbs. 178.31 kg.
Operating ambient temperature (Refer to NIC ports above)	0-50 °C; 32-122 °F (i) 4x RJ45 ports 0-40 °C; 32-104 °F (ii) 1 RJ45, 3x SFP ports	0-60 °C; 32-140 °F
Storage ambient temperature	-40 to 70 °C; -40-158 °F	-40 to 70 °C; -40-158 °F
Operating humidity	0 - 95% Non-condensing	0 - 95% Non-condensing
Storage humidity	0 - 95% Non-condensing	0 - 95% Non-condensing
Capacity	Redundant controllers, 32 I/O modules, 2 power supplies	Space for spare equipment, 32 I/O modules, 2 power supplies

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