S-series Ethernet I/O Card

■ Powerful solution that communicates directly to external Ethernet I/O networks.

■ Easy connection to devices using Modbus TCP, EtherNet /IP or IEC61850 MMS protocols.

■ Proven S-series packaging.

■ Modular with easy to add redundancy.

■ Communication to any M- and S-series Controller.

The S-series EtherNet I/O Card provides direct connection to Ethernet I/O networks.

Introduction

The Ethernet I/O Card (EIOC) provides a platform to access data from intelligent field devices (IFDs) in the DeltaV system. Field devices capable of Modbus TCP, EtherNet /IP, and IEC 61850 MMS (Manufacturing Message Specification) protocols are supported.

The EIOC provides monitoring and control of devices on the Device Network via control modules assigned to and executed in the EIOC. PLCs, Motor Control Centers, drives, switchgear and other EtherNet devices can be controlled directly by the EIOC, independent of a controller.

Benefits

Ability to communicate directly to Ethernet I/O networks. Use the EIOC to monitor and control Ethernet protocol based intelligent field devices.

■ **Powerful.** The EIOC provides direct access for up to 256 physical devices. For each of the 256 Physical Devices (PDTs), the EIOC data hierarchy supports up to 256 Logical Devices (LDTs). These Logical Devices can supports up to 100 data values each. This allows for huge amounts of data to be sorted in a way that makes sense to you.

DELTAV™

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Process Management

- **Monitoring.** Data values integrated into the EIOC can be used in Control Modules running inside the EIOC. These control modules allow alarm generation, history collection, and viewing by the operator, as with control modules running in a Controller using traditional DeltaV native I/O.

- **Supports Control Functionality.** In addition, function blocks allowing for discrete control and limited PID control are supported for the EIOC. Motors, valves, variable frequency drives; field devices that communicate with EtherNet /IP can be controlled directly from the EIOC.

Easy to connect to devices using Modbus TCP, EtherNet /IP or IEC61850 MMS protocols. Use the EIOC Ethernet based protocols to connect your DeltaV system to your Ethernet I/O device networks.

- **Huge data capacity.** Each EIOC is capable of handling a huge amount of Data in up to 2000 Control Modules. The data can be collected from 256 physical devices that have up to 256 logical devices and a total of 32,000 data values.

- **EIOC.** Part of the I/O Network. 60 EIOC's can be added to the DeltaV I/O Network, allowing maximum freedom in segregating networks.

- **Flexible networking.** User configurable IP addressing for the device network allows the EIOC to be used in almost any plant environment regardless of the networking scheme. Simply put, the EIOC and the Ethernet field devices must be on the same IP subnet to communicate.

- **Easy to add Redundancy.** Redundancy can be added to the EIOC by simply adding a second Ethernet I/O Card on the dual universal carrier. The configuration will change automatically confirming that the two cards are now working as a redundant pair. Manual switchovers can be controlled in DeltaV Diagnostics.

Easy to use. The EIOC is easy to use as it represents a native way to bring Ethernet protocol based data into the DeltaV system. Specific ease of use features include:

- **You can choose** between the 3 different Ethernet based protocols included in the EIOC. Each EIOC supports one protocol and once the protocol license is assigned, the protocol can be selected from the drop down list. Just select the one you want to use from the drop down menu.

- **Updates** for the Ethernet I/O Card and their drivers are included within the DeltaV releases.

- **Configured in DeltaV Explorer** All needed configuration for the Ethernet I/O data is done in the DeltaV Explorer and DeltaV Control Studio, like tradition I/O signals. The data can be configured in DeltaV Control Modules, displayed on DeltaV Operate graphics and stored in the DeltaV Continuous Historian.

Modular, easy to add Redundancy. The dual universal carrier hosts all the needed components for a redundant setup, which includes redundant Power input Terminals as well as redundant Ethernet Isolation ports, isolating the redundant ACN communication from the redundant Ethernet device Network. For the EtherNet device network, both the Modbus TCP and EtherNet /IP protocols support redundant communications. The IEC61850 MMS protocol supports simplex communication on the device network.

Product Description

The EIOC is a big pipe for the integration of process data from 3rd party devices, such as PLCs and smart field devices such as Intelligent Field Devices (IFDs) and Intelligent Electronic Devices (IEDs). A network of these Ethernet devices can be directly connected to the EIOC. The devices can communicate to the EIOC using one of three protocols; Modbus TCP, EtherNet /IP, and IEC61850 MMS. The EIOC lives in the I/O network of the DeltaV hierarchy and, like the CIOC, can be placed remotely in an enclosure in the field.

The EIOC is an independent embedded data server. This means that there is no need for a separate controller to process the data being integrated into the EIOC. Control Modules needed to process the data from the field devices are assigned and executed in the EIOC. In this way, communications with the devices are fast and direct. Any parameters from the modules running in the EIOC can be read by both S-series and M-series controllers using External References when needed in control strategies at the controller level.

When configuring the EIOC Control Modules, all typical Function blocks needed for continuous operation are available; however, the usage of the following Function blocks are limited in the EIOC:

- 256 EDC's and DCC's – used for such applications as motor control in MCCs.

- 26 PID's – analog control where all or most of the signals are Ethernet based.

- 4 SEQs – Sequence function block used for sequencing motor control states.

- 4 STDs – State Transition Diagram - used in sequencing and can be used with the SEQ function blocks.

Batch control, SFCs, PLMs, and Equipment Modules are not supported in the EIOC. PCSD discrete control modules are not supported in the EIOC. The EDC and DCC function blocks replace the functionality in these modules and eliminate loading issues. The new PCSD library will have new module classes utilizing the new function blocks.

To maintain the capacity of the EIOC, consideration should be taken to keep modules as lean as possible. Heavy configuration in the modules will decrease the capacity of 2000 modules in the EIOC.

Listed by category, the following is a complete list of the function blocks available with the EIOC.

Advanced Control – None.

Advanced Functions – State Transition, Step Sequencer.

Analog Control – Analog Tracking, Calc/Logic, Filter, Input Selector, Scaler, Signal Characterizer, Signal Generator, Signal Selector, Bias/Gain, Manual Loader, PID, Rate Limit, Ramp, Splitter, Limit.

Energy Metering – None.

IO – Alarm Detection, AI, AO, DI, DO.

Logical – All except DC.

Math – All.

Special Items – All.

Timer Counter – All.

Providing access from the EIOC control modules to the DeltaV Operator Interface graphics follows the same rules and mechanisms as control modules running in the controllers in a DeltaV System.

The same is true for the alarms and history collection.

Simplex EIOC (Protection cover installed in the redundant EIOC slot in the dual universal carrier).

The EIOC mounts on the dual universal carrier which includes redundant Power input Terminals as well redundant Ethernet.

Isolation ports. The Ethernet Isolation ports isolate the redundant ACN communication from redundant Ethernet based Device Networks by acting like the Controller firewall. In this way, Robustness and Security is ensured.
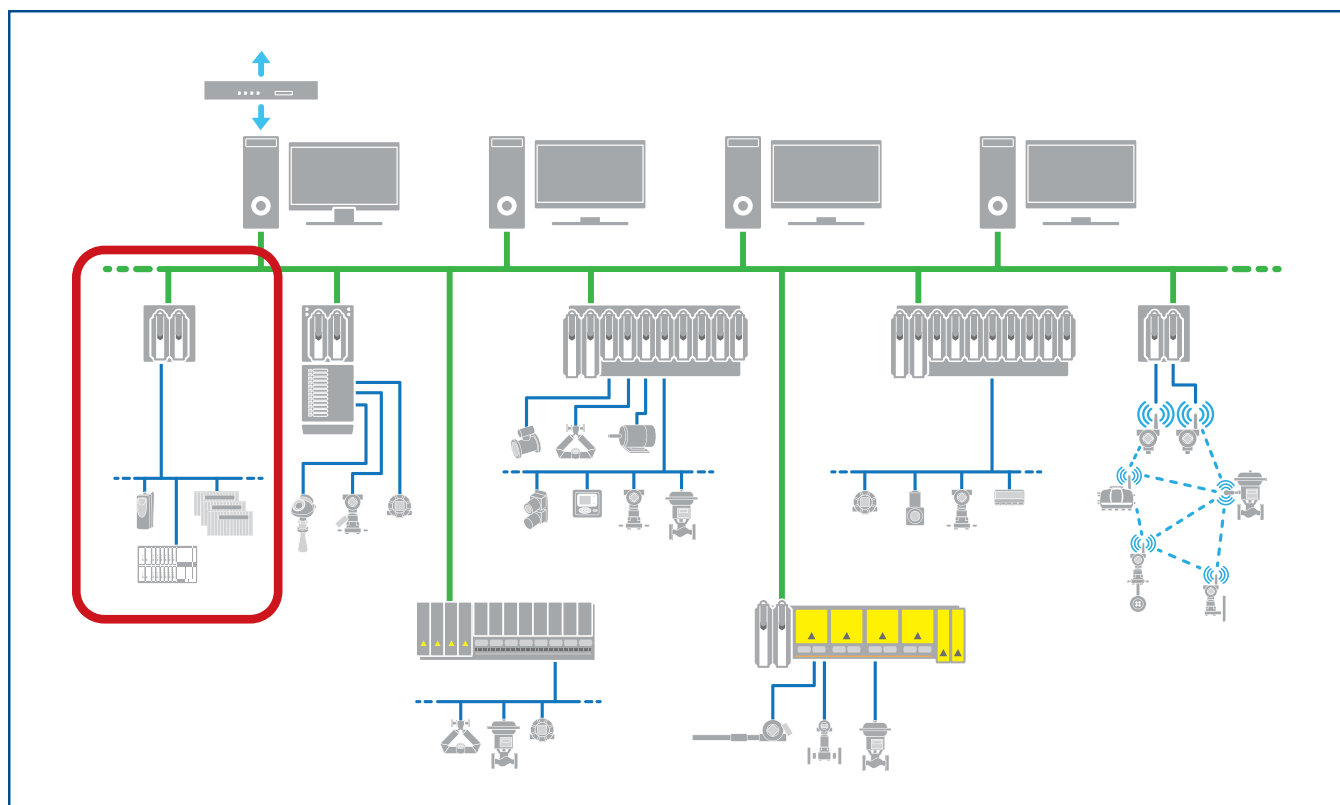
The DeltaV system with a redundant EtherNet I/O Card and simplex connection to the intelligent field devices.

Supported Industrial Ethernet Protocols:

Modbus TCP Interface

The Modbus TCP interface will support Modbus data sources such as programmable logic controllers (PLCs); motor control centers (MCCs), analyzers and similar devices communicating Modbus TCP. The Modbus TCP interface is a Modbus client (Master) reading and writing data from/to Modbus servers (Slave devices). The Modbus server devices can be Modbus TCP devices or Modbus serial devices using a Modbus TCP gateway.

The Modbus TCP interface supports the following types of data access using the Modbus TCP protocol:

- Reading input data from Modbus Coils, Discrete Input, Holding Registers, and Input Registers.

- Writing output data to Coils and Holding registers.

All reads will be performed periodically and outputs will be sent when they are written.

EtherNet /IP Communications

The EtherNet /IP protocol allows data sources such as PLCs, and Intelligent Field Devices (IFDs), such as variable-speed drives, MCCs, and analyzers; as well as other devices communicating EtherNet /IP to connect directly into the DeltaV DCS via the EIOC.

The EtherNet /IP interface will support connections for both implicit and explicit messaging to allow access to both Class 1 and Class 3 EtherNet /IP I/O adapter devices. Redundancy with EtherNet /IP Class 1 Implicit and Class 3 Explicit messaging for control (sending outputs to the devices) require special considerations due to exclusive owner communications defined by the protocol. Please refer to the DeltaV System Planning Guide for more information. Class 3 PCCC and UCMM with Logix tags message classes are also supported.

IEC 61850 (MMS)

The IEC 61850 MMS interface will allow data from Intelligent Electronic Devices (IEDs) such as motor protection relays, motor starters, motor control centers, switchgear, and similar MMS-based devices to be integrated into DeltaV. The MMS interface will be a client reading and writing data from/to the Intelligent Electronic Device which acts as the server. Device network redundancy is not supported for the IEC61850 MMS protocol in DeltaV v13.

Goose applications are not supported for the EIOC.

EIOC Licensing

Licensing is easy with the EIOC. Buy the hardware assembly for the EIOC which can be simplex or redundant, no license there. Only one protocol per EIOC is permitted, and you pick the license for the protocol desired. DST licenses are assigned based on the LDTs and highest point value in the LDT.

Summary

The EIOC supports communications with Ethernet based devices using Modbus TCP, EtherNet /IP, and IEC61850 MMS. The EIOC supports up to 256 devices and 32000 signals. Polling and switchover times vary based on protocol, device type, and loading. Refer to the DeltaV System Planning Guide for more information.

The EIOC capacity lends itself to very large integration projects with limited control needs.

Batch components such as SFCs and PLMs are not supported in the EIOC. Extensive external referencing to the EIOC for applications such as VFD control and Batch control is not advised. See the PDS for the VIM2 which supports those applications.
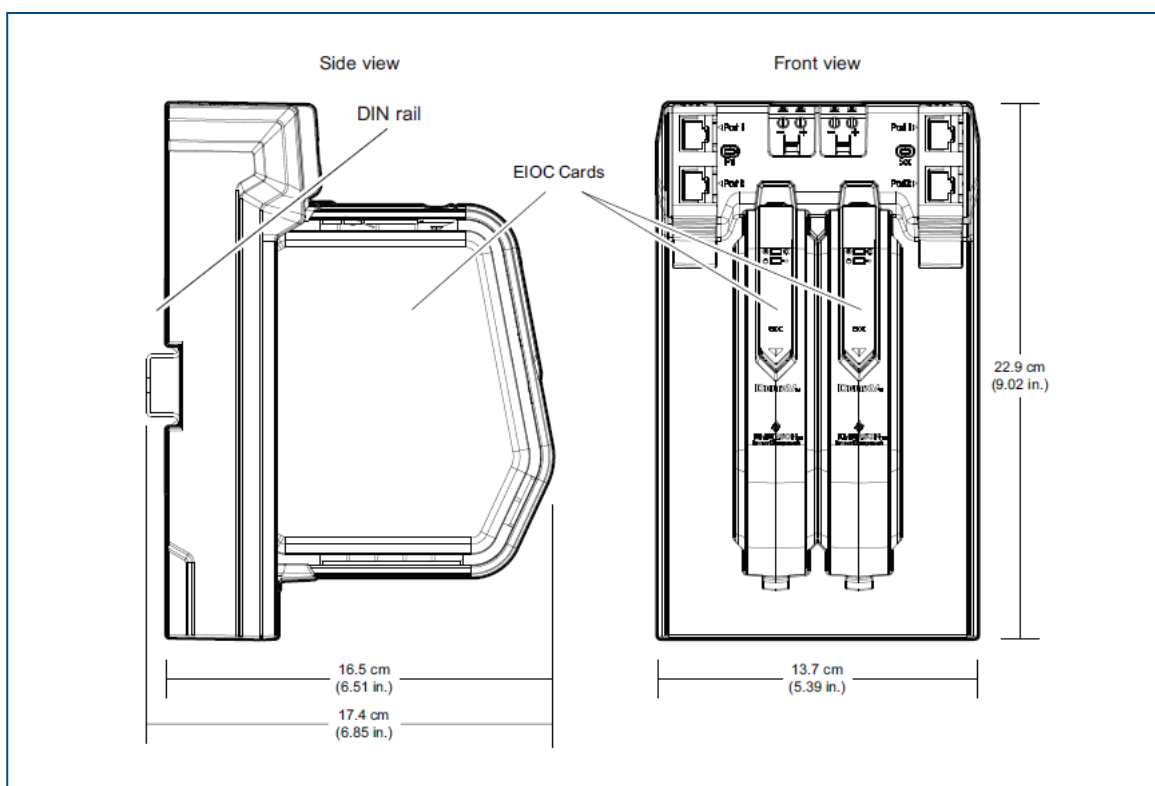
EIOC and DualUniversal Carrier.
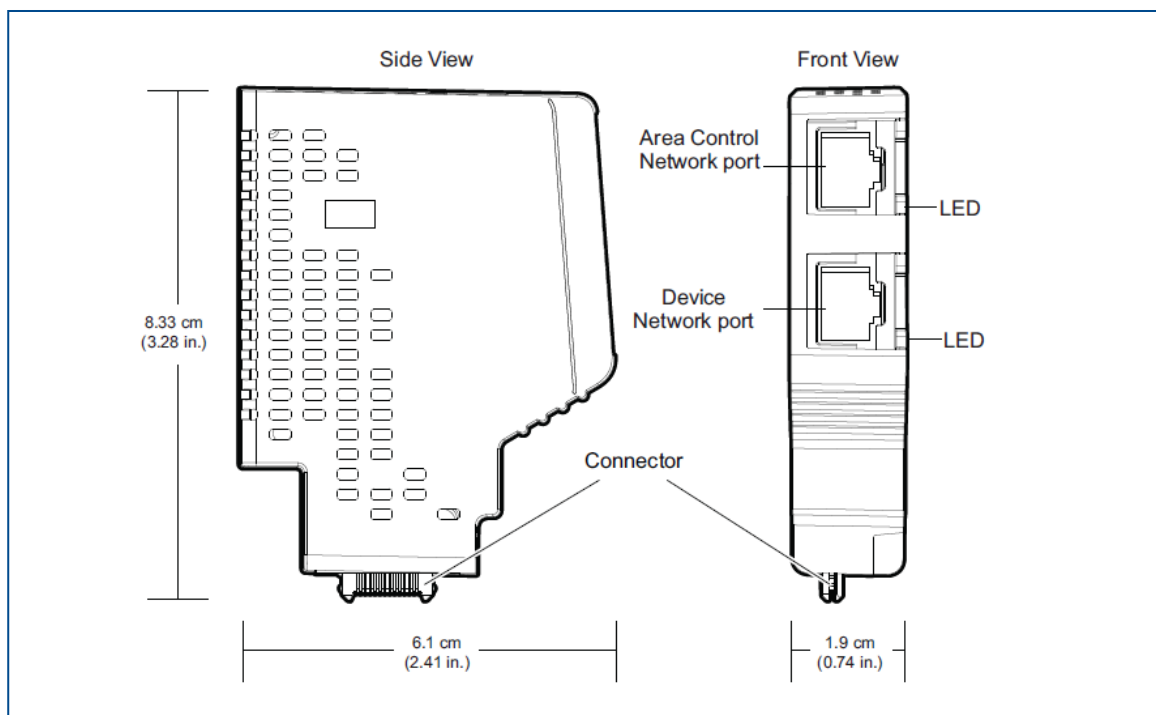
EIOC Ethernet Isolation Port.

Hardware Specifications

Common Environmental Specifications (all components)	
Operating Temperature	-40 to 70°C (-40 to 158°F)
Storage Temperature	-40 to 85°C (-40 to 185°F)
Relative Humidity	5 to 95% , non-condensing
Protection Rating	IP 20, NEMA 12
Airborne Contaminants	ISA-S71.04-1985 Airborne Contaminants Class G3 Conformal coating
Shock	10 g ½-sine wave for 11 ms
Vibration	1mm Peak-to-Peak from 2 to 13.2 Hz; 0.7g from 13.2 to 150 Hz

Carrier Specifications

Specifications for Dual Universal Carrier	
Capacity	One (simplex) or two (redundant) EIOC
Input Power	+24 VDC ±10% at 1 A maximum
Redundant Ethernet connections via replaceable Ethernet Isolation Ports (EIPs)	Copper twisted pair: 10/100BASE-TX with RJ45 connectors; Full duplex operation - 100 m distance
Mounting	DIN rail latch to horizontally orientated T-type rail

EIOC Hardware Specifications

Specifications for the Ethernet I/O Card	
Number of EIOCs Per System	60
Input Power	+24 VDC ± 10% at 325 mA maximum for simplex; 575 mA maximum for redundant
Heat Dissipation (Redundant)	7 Watts maximum for simplex; 13 Watts maximum for redundant
Fuse Protection (Internal)	Internal Non-replaceable Fuse
Mounting	One or two slots on the Dual Universal Carrier
Communication	Redundant Ethernet connections via Dual Universal Carrier to the: a) Device Network b) Area Control Network (ACN)
ACN Network Addressing	Auto Assigned during commissioning
Device Network Addressing	Manual, Master only
Control Module Limit	2000
Max Data Values Sent	4000/second
Max Data Values Received	500/second
Max I/O Network Nodes	300
Module Execution Rates	100ms, 200ms, 500ms, 1s, 2s, 5s, 10s, 30s, 60s
LED Indicators	
Green – Power	Indicates DC power is applied
Red – Error	Indicates an error condition
Green – Active/Standby	Indicates operating mode of each EIOC
Yellow flashing – Pri./Sec. CN	Indicates valid control network communication

Certifications

The following certifications are available for the EIOC:

- **CE:**

  - EMC- EN 61326-3-1:2006

  - LVD: Directive 2006/95/EC Aug 2007

- **FM:**

  - FM 3600, Dec. 2011

  - FM 3611, Dec. 2004

  - FM 3810, Jan 2005

  - ANSI/ISA 60079-0, Oct 2009

  - ANSI/ISA 60079-15, Jul 2009

- **CSA:**

  - CSA C22.2 No. 213-M1987, 1987
  (Reaffirmed 2008)

  - CSA C22.2 No. 61010-1, 2004
  (Reaffirmed 2009)

  - CAN/CSA-E60079-0, 2007

  - CAN/CSA-E60079-15, March 2002
  (Reaffirmed 2006)

- **ATEX:**

  - ATEX 94/9/EC

  - EN60079-0: 2009

  - EN60079-15:2005

  - EN60079-15:2010

- **IEC-Ex:**

  - IEC60079-0:2007

  - IEC60079-15:2005

  - IEC60079-15:2010

Certifications

The EIOC will be submitted for the following certifications:

- **Marine Certifications:**

  IACS E10:2006 Rev.5 Control, Protection & Safety;
  DNV 2.4:2006

  - ABS Certificate of Design Assessment

  - Bureau Veritas Certificate

  - DNV Marine Certificate

  - Lloyds Register

- **EAC Hazardous Area certification Zone 2
  (Russian, Belarus, Kazakhstan)**

Hazardous Area/Location:

The EIOC can be installed and used based on the following Standards:

- FM (USA):
  Class I, Division 2, Groups A, B, C, D, T4

- cFM (Canada):
  Class I, Division 2, Groups A, B, C, D, T4

- ATEX:
  ⟨Ex⟩ Ex nA IIC T4 Gc

- IEC-Ex:
  Ex nA IIC T4 Gc

Regarding the Installation instructions please refer to the following Documents:
Class 1 Division 2 Installation Instructions DeltaV S-Series   12P5402 Rev. C
Zone 2 Installation Instructions DeltaV S-Series   12P5404 Rev. C

Ordering Information

Description	Model Number
Simplex Ethernet I/O Card (EIOC) Assembly, (Includes EIOC, Dual Universal Carrier, Universal Carrier Protection Cover, 2 Ethernet Isolation Ports for twisted copper, 2 Power Plugs)	SE4100
Redundant Ethernet I/O Card (EIOC) Assembly, (Includes 2 EIOC, Dual Universal Carrier, 2 Ethernet Isolation Ports for twisted copper, 2 Power Plugs)	SE4101
MODBUS TCP Interface for Ethernet I/O Card (EIOC)	VE4103
EtherNet/IP Interface for Ethernet I/O Card (EIOC)	VE4105
IEC 61850 Interface for Ethernet I/O Card (EIOC)	VE4107

Prerequisites

- DeltaV v13.3 Systems and higher

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