Integrated Power and Automation

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

| ![Warning] | **WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss. |
| ![Attention] | **ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence. |
| ![Important] | **IMPORTANT** Identifies information that is critical for successful application and understanding of the product. |

Labels may also be on or inside the equipment to provide specific precautions.

| ![Shock Hazard] | **SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present. |
| ![Burn Hazard] | **BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures. |
| ![Arc Flash Hazard] | **ARC FLASH HAZARD:** Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE). |
Table of Contents

Preface .........................................................5
   About This Publication .................................. 5
   Terminology ............................................. 5
   Additional Resources .................................... 6

Chapter 1
   Rockwell Automation Integrated Power and Automation .......... 7
   A Unified Architecture with the IntelliCENTER IEC 61850
   Integration Unit .......................................... 8

Chapter 2
   Logix Controller .......................................... 9
   Stratix 5700 Managed Switch ............................. 10
   ProSoft Gateway ......................................... 10
   Stratix 5950 Security Appliance .......................... 10
   PanelView Plus 7 .......................................... 11

Chapter 3
   Connecting IntelliCENTER IEC 61850 Integration Unit
   to Electrical Protection Devices ........................... 13
   IEC-61850 Specifics ....................................... 14
   VLAN Segmentation ....................................... 14
   Testing, Sizing, and Characterization Guidelines for the
   IntelliCENTER IEC 61850 Integration Unit ............... 15
   Sample System ........................................... 15
   Test Configuration ....................................... 16
   Configuration Overview ................................ 17
   Test Requirements ....................................... 19
   Evaluation Criteria ..................................... 19
   Test Results ............................................ 19

   Converged Plantwide Ethernet (CPwE) Guidelines For
   Connecting the IntelliCENTER IEC 61850 Integration Unit to
   PlantPAx Process Automation System ...................... 21
   Simplex Integration ..................................... 22
   Redundant Integration ................................... 23

Index .........................................................25
About This Publication

This manual describes the Allen-Bradley® IntelliCENTER® IEC 61850 Integration Unit with a focus on the system architecture and integration into your plant.

Terminology

This table defines abbreviations that are used in this manual.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOP</td>
<td>Add-on Profile</td>
<td>Studio 5000 Logix Designer® application tool that is used to integrate devices into the programming environment.</td>
</tr>
<tr>
<td>CID</td>
<td>Configured IED Description files</td>
<td>An XML file that defines all information that can be communicated from the IED.</td>
</tr>
<tr>
<td>CIP™</td>
<td>Common Industrial Protocol</td>
<td>Industrial protocol for industrial automation applications that ODVA supports.</td>
</tr>
<tr>
<td>CPwE</td>
<td>Converged Plantwide Ethernet</td>
<td>A Cisco and Rockwell Automation collaboration to provide recommendations and guidance to help the following:</td>
</tr>
<tr>
<td>DCS</td>
<td>Distributed Control System</td>
<td>A specially designed control system for complex and large applications in industrial processes wherein the control elements of the system are distributed geographically throughout the plant. In a DCS, a hierarchy of controllers is connected by communication networks for command and monitoring.</td>
</tr>
<tr>
<td>GOOSE</td>
<td>Generic Object Oriented Substation Event</td>
<td>A control strategy to remotely collect and control devices in a distributed system.</td>
</tr>
<tr>
<td>IED</td>
<td>Intelligent Electrical Devices</td>
<td>These devices can consist of feeder protection devices, motor protection devices, transformer protection devices, generator protection devices, intelligent circuit breakers, and power monitors.</td>
</tr>
<tr>
<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers</td>
<td>Organization that standardizes electrical engineering practices.</td>
</tr>
<tr>
<td>IMC</td>
<td>Intelligent motor control</td>
<td>Motor control devices that can connect to a communication network.</td>
</tr>
<tr>
<td>IPA</td>
<td>Integrated Power and Automation</td>
<td>The Rockwell Automation® Integrated Power and Automation (IPA) solution combines the communication efforts of EtherNet/IP and IEC 61850 networks into one seamless architecture where intelligent motor control and intelligent electrical control are represented through one control, visualization, and reporting system while operating on separate networks.</td>
</tr>
<tr>
<td>MCC</td>
<td>Motor control center</td>
<td>A motor control center is an assembly of one or more enclosed sections having a common power bus and contains motor control units. A motor control center can include variable frequency drives, programmable controllers, and metering units.</td>
</tr>
<tr>
<td>ODVA</td>
<td>—</td>
<td>Organization that standardizes communication networks that use CIP among other technologies.</td>
</tr>
<tr>
<td>PAC</td>
<td>Programmable Automation Controller</td>
<td>Multidiscipline controllers that are used across manufacturing disciplines such as discrete, continuous process, batch, drive, motion, and safety.</td>
</tr>
<tr>
<td>SCADA</td>
<td>Supervisory Control and Data Acquisition</td>
<td>A control strategy to remotely collect and control devices in a distributed system.</td>
</tr>
<tr>
<td>VLAN</td>
<td>Virtual local area network</td>
<td>Tool that is provided in Layer 2 switches that allows similar networked devices to be grouped in a broadcast domain.</td>
</tr>
<tr>
<td>WAN</td>
<td>Wide Area Network</td>
<td>This type of network consists of infrastructure in which the network traffic is passed through points that the user does not own and can then be referred to as an untrusted network.</td>
</tr>
</tbody>
</table>
These documents contain more information about related products from Rockwell Automation.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IntelliCENTER IEC 61850 Integration Unit Installation Instructions, publication 3300A-IN001</td>
<td>Provides installation instructions for the IntelliCENTER IEC 61850 Integration Unit.</td>
</tr>
<tr>
<td>IntelliCENTER IEC 61850 Integration Unit Technical Data, publication 3300A-TD001</td>
<td>Provides specifications and unit selection information for the IntelliCENTER IEC 61850 Integration Unit.</td>
</tr>
<tr>
<td>CompactLogix™ 5380 Controllers Specifications Technical Data, publication 5069-TD002</td>
<td>Provides specifications, wiring diagrams, and functional block diagrams for CompactLogix 5380 controllers.</td>
</tr>
<tr>
<td>1756 ControlLogix® and GuardLogix® Controllers Technical Data, publication 1756-TD001</td>
<td>Provides specifications ControlLogix 5580 controllers.</td>
</tr>
<tr>
<td>Stratix Ethernet Device Specifications Technical Data, publication 1783-TD001</td>
<td>Provides specifications for the Stratix switches.</td>
</tr>
<tr>
<td>PlantPAx® Rockwell Automation Library for Electrical Protection Devices Reference Manual, publication PROCESS-RM011</td>
<td>Provides information on how to configure the Add-On Instructions that control and monitor intelligent power devices that use the IEC 61850 standard in the PlantPAx system.</td>
</tr>
<tr>
<td>ProSoft Communication Gateway User Manual</td>
<td>Provides information and specifications for the IEC 61850 to Ethernet network gateway.</td>
</tr>
<tr>
<td>CompactLogix 5380 Controllers User Manual, publication 5069-UM001</td>
<td>Provides information on how to use CompactLogix 5380 controllers.</td>
</tr>
<tr>
<td>ControlLogix System User Manual, publication 1756-UM001</td>
<td>Provides information on how to use ControlLogix 5580 controllers.</td>
</tr>
<tr>
<td>Stratix 5700 Industrial Ethernet Switch Product Profile, publication ENET-PP005</td>
<td>Provides Stratix 5700 switch information.</td>
</tr>
<tr>
<td>Stratix 5700 Ethernet Managed Switches User Manual, publication 1783-UM007</td>
<td>Provides Stratix 5700 switch information.</td>
</tr>
<tr>
<td>Stratix 5950 Security Appliance User Manual, publication 1783-IN010</td>
<td>Provides a product overview, explains how to connect and configure the security appliance.</td>
</tr>
<tr>
<td>PanelView™ Plus 7 Standard Terminals, publication 2711P-UM007</td>
<td>Provides information to install, configure, operate, and troubleshoot the PanelView Plus 7 Standard terminals.</td>
</tr>
<tr>
<td>Converged Plant-wide Ethernet (CPwE) Design and Implementation Guide, publication ENET-TD001</td>
<td>Describes how to design a Converged Plantwide Ethernet network.</td>
</tr>
<tr>
<td>Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1</td>
<td>Provides general guidelines for installing a Rockwell Automation industrial system.</td>
</tr>
</tbody>
</table>

You can view or download publications at http://www.rockwellautomation.com/global/literature-library/overview.page. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.
Introduction to Integrated Power and Automation

Coordination of large distributed measurement and control systems, like SCADA and other process control implementations, requires robust networks that connect thousands of remote devices. Whether it’s a new plant or an upgrade, miscommunication between technology vendors and system engineers during design phases can cause future unforeseen integration challenges. With electrical power distribution and automation control systems being traditionally supplied independently, unnecessary complexity and cost throughout the life of the solution can arise.

By using the EtherNet/IP protocol, intelligent motor control devices communicate and work as a part of the process control system. Simultaneously, critical substation equipment communicates with intelligent electrical devices (IED) over an unmodified Ethernet network that is based on the IEC 61850 standard. Both of these communication standards are typically kept independent with separate control, visualization, and reporting environments, which duplicates the effort to monitor devices and keep systems operational.

The Rockwell Automation’ Integrated Power and Automation (IPA) solution combines these efforts into one seamless architecture where intelligent motor control and intelligent electrical control are represented through one control, visualization, and reporting system while operating on separate networks. This control is accomplished by bridging a portion of the IEC 61850 traffic into the Studio 5000 Logix Designer’ environment and representing important data within FactoryTalk’ software for user consumption. Once established, customers can use the Logix Designer application and FactoryTalk software as their single environment for their system architecture.

Some electrical control processes require equipment to be supplied from multiple vendors. Rockwell Automation has partnered with multiple vendors to give customers flexibility and choose the best products to suit their electrical control application needs. Once chosen, Rockwell Automation coordinates the delivery of this equipment in a cost-effective manner, and verifies that the integration of the equipment is seamless on the back end.
A Unified Architecture with the IntelliCENTER IEC 61850 Integration Unit

Rockwell Automation has a long history of device connectivity with the Logix Designer application. To deliver a common experience when communicating with devices over the IEC 61850 standard, the IntelliCENTER® IEC 61850 Integration Unit was developed. The integration unit contains standard hardware and standard software to bring a portion of the IEC 61850 traffic into the Logix architecture, delivering ease-of-use and seamless integration.

Inside the integration unit is all equipment necessary to bridge the IEC 61850 traffic into Logix Designer. This equipment includes a gateway for communication bridging, a Stratix® 5700 switch for aggregation of device connections and segmentation, and a ControlLogix® or CompactLogix™ rack. Also, there are options for a PanelView™ terminal for data representation and a Stratix Security Appliance if unsecured upstream connections are required.

Once inside the Logix architecture, the IEDs are monitored within FactoryTalk software with Process Object Library faceplates. By using the integration unit, you can unify power and process systems within the Logix and FactoryTalk environments to create one operating environment.

Faceplates for the Allen-Bradley® 857 Motor Protection Relay, ABB circuit breakers, and Schweitzer protection relays verify that you can choose the appropriate device that meets the needs of your application. These faceplates look and operate like all other Allen-Bradley intelligent devices, delivering a common user interface for the single monitoring and reporting environment.
Chapter 2

Components and Core Elements of IPA

The IntelliCENTER® IEC 61850 Integration Unit contains core components that are part of the configured to order product. By leveraging the control capabilities of a Rockwell Automation® Logix processor, network management from Stratix® managed switches, optional visualization with PanelView™ Plus 7 terminals, and enhanced security functions with the Stratix 5950 Security Appliance, the integration unit enables the intelligent switchgear and intelligent E-house to become part of the Integrated Architecture® system. This system provides ease of integration into the existing network of intelligent motor control devices and lets you take advantage of a unified architecture throughout the facility.

The PlantPAx® distributed control system is a modern DCS that is not only scalable and flexible, but provides functionality, reliability, and performance consistence with expectations from a traditional DCS. The PlantPAx system is able to integrate control systems that use intelligent motor control and intelligent electrical protection devices. The components within the integration unit are essential to make integration possible into a Logix processor and leverage the benefits of the Integrated Architecture system.

Logix Controller

When specifying the components inside of the integration unit, there are two options when selecting the programmable controller:

- **CompactLogix® 5380 controller** - can be used for mid-range applications such as batch processing or machine control when you need a chassis-based, modular design.
- **ControlLogix® 5580 controller** - offers increased I/O and network options and is designed to work in distributed or supervisory control applications.

Both the CompactLogix and ControlLogix programmable controllers can be accessed and programmed by using the Logix Designer application.
**Stratix 5700 Managed Switch**

The Stratix 5700 managed switches are compact and scalable Layer 2 switches with embedded Cisco technology for use in a wide range of applications from small and isolated to large complex networks. The Stratix 5700 managed switch integrates into Studio 5000® applications.

Industrial-managed Ethernet switches are designed to give you the flexibility and features that helps prevent lost data due to Layer 2 faults and broadcast traffic, which is critical to network performance. With an industrial managed Ethernet switch, network segmentation, such as Virtual LANs (VLANs), and network resiliency, such as Resilient Ethernet Protocol (REP), can be implemented to make sure that network performance is maintained across a complex industrial Ethernet network.

Advanced security, network management, and diagnostics are other critical features that are provided in an industrial managed Ethernet switch. These features make sure that the expected recipient receives the information being sent over the network at the expected time while network issues are allowed to be easily resolved.

For more information on the Stratix 5700 switch, see publication 1783-UM007.

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**ProSoft Gateway**

The ProSoft PLX82-EIP61850 gateway module is used to convert the IEC 61850 traffic to EtherNet/IP traffic, which the Logix controller consumes. This conversion makes it possible for the Logix controller to interface with IEC 61850 intelligent electronic devices such as substation protective relays and power monitoring equipment.

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**Stratix 5950 Security Appliance**

The Stratix 5950 Security Appliance incorporates several key security functions into one appliance to help protect your industrial automation infrastructure. The Stratix 5950 Security Appliance provides control to network traffic.

The typical Wide Area Network (WAN) consists of infrastructure in which the network traffic is passed through points that the user does not own and can then be referred to as an untrusted network. The integration unit can be configured with a Stratix 5950 Security Appliance to interface with the untrusted network.

For more information on the Stratix 5950 Security Appliance, see publication 1783-UM010.
PanelView Plus 7

The optional PanelView Plus 7 terminal is an operator interface device that is used to monitor and control devices that are connected to the CompactLogix or ControlLogix controller over an EtherNet/IP network. The terminal can be used to display information critical to the IED or process, and provide quick diagnostics and ability to configure the system.
Connecting IntelliCENTER IEC 61850 Integration Unit Into the Plant Network

Within the Unified Architecture, it is important that a developed network is not only robust for the current needs of operations, but allows the system infrastructure to evolve over time without requiring a substantial overhaul. This chapter focuses on the process and recommended practices for connecting the IntelliCENTER® IEC 61850 Integration Unit to the plant-wide network infrastructure.

Connecting IntelliCENTER IEC 61850 Integration Unit to Electrical Protection Devices

When connecting the integration unit to the IEC 61850 network, it is important to note the number of ProSoft IEC 61850 Gateways that are installed in your particular unit. The number of gateways equals the number of cables that are required to interface the integration unit to the IEC 61850 network of electrical protection devices. For each ProSoft Gateway, there is one network cable that is required to interface to the IEC 61850 network. This network segmentation allows for an evaluation and characterization of network traffic of the gateway module itself.

See Testing, Sizing, and Characterization Guidelines for the IntelliCENTER IEC 61850 Integration Unit for more information.

Figure 1 shows how the integration unit connects to a system of Intelligent Electrical Devices (IEDs).

Figure 1 - System Configuration
**IEC-61850 Specifics**

The IntelliCENTER IEC 61850 Integration Unit has been tested and characterized for the performance of a 40 IED system in an MMS client configuration.

**IMPORTANT**

For each ProSoft module in the integration unit, there is one network connection to the IEC 61850 network. The network infrastructure (provided outside the integration unit) must be selected and sized to handle the IEC 61850 traffic loading.

**IMPORTANT**

All testing and validation that is provided in this document was done based on MMS buffered reports and MMS commands. None of the characterization testing that is provided for this document included GOOSE subscriber functionality.

When connecting to an IEC 61850 switch, note the following considerations:

- The switch supports IEEE C37.238 (Power Profile PTP) if time synchronization required.
- The switch supports a Quality of Service (QoS) specifically for IEDs.

**VLAN Segmentation**

The best way to segment IEC 61850 traffic is by using virtual local area networks (VLANs). This methodology lets you configure ports on a managed switch in a logical fashion for traffic management. For example, IEC 61850 traffic is subjected to ports where IEDs are connected, while HMI traffic is segmented on another VLAN, thus reducing the amount of traffic on each logical network. Use best practices to separate the ports for which the ProSoft modules are connected to on the IEC 61850 network to minimize the amount of multicast and GOOSE (Generic Object Oriented Substation Event) traffic to those switch ports.
Testing, Sizing, and Characterization Guidelines for the IntelliCENTER IEC 61850 Integration Unit

The integration unit is a flexible system that you can scale to fit multiple applications. Application size and system response requirements are the two main drivers that are used for the sizing of the integration unit for an application. This section discusses how the system was tested and suggests recommended settings for operation of the integration unit.

Sample System

It is recognized that most industrial and commercial power systems consist of various IEDs based on function. Systems can consist of feeder protection devices, motor protection devices, transformer protection devices, generator protection devices, intelligent circuit breakers, and power monitors. The testing of the integration unit is based on a 40 IED system that is shown in Figure 2.

Figure 2 - Typical Industrial and Commercial Power System

This representative system consists of three voltage levels and on-site generation that feeds various loads and motors at both medium and low voltage. For this test, we use SEL 700 series IEDs (Schweitzer Engineering Laboratories) to provide traffic loading on the system. Specifically, we used SEL 700G, 787, 751A, and 710 IEDs for testing.
Test Configuration

Table 1 and Table 2 describe the test setup that is used to benchmark the integration unit. Figure 3 depicts the test setup and configuration in graphical form.

Table 1 - Hardware Requirements

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Quantity</th>
<th>Vendor</th>
<th>Fw Rev</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLX82-EIP-61850</td>
<td>4</td>
<td>ProSoft Technology</td>
<td>1.03.001</td>
<td>EUT (Equipment Under Testing)</td>
</tr>
<tr>
<td>1756-L81E</td>
<td>1</td>
<td>Rockwell Automation</td>
<td>V30</td>
<td>Processor</td>
</tr>
<tr>
<td>1783-BMS10CGN</td>
<td>2</td>
<td>Rockwell Automation</td>
<td>15.2(4)EA3(f1)</td>
<td>Stratix Managed Ethernet Switch</td>
</tr>
<tr>
<td>1756-A7</td>
<td>1</td>
<td>Rockwell Automation</td>
<td>—</td>
<td>7-slot rack</td>
</tr>
<tr>
<td>1756-PA72</td>
<td>1</td>
<td>Rockwell Automation</td>
<td>—</td>
<td>Power Supply</td>
</tr>
<tr>
<td>1606-XLE240E</td>
<td>1</td>
<td>Rockwell Automation</td>
<td>—</td>
<td>Power Supply</td>
</tr>
</tbody>
</table>

Table 2 - Software Requirements

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Quantity</th>
<th>Vendor</th>
<th>Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTM</td>
<td>1</td>
<td>Triangle Microworks</td>
<td>V1.2.1.9</td>
<td>EUT (Equipment Under Testing)</td>
</tr>
<tr>
<td>Studio 5000®</td>
<td>1</td>
<td>Rockwell Automation</td>
<td>V30</td>
<td>Processor programming tool</td>
</tr>
<tr>
<td>EIP-61850</td>
<td>1</td>
<td>ProSoft Technology</td>
<td>V2.0.0.22.0001</td>
<td>EUT configuration tool</td>
</tr>
<tr>
<td>Wireshark</td>
<td>2</td>
<td>Wireshark</td>
<td>V2.2.7</td>
<td>Network Protocol Analyzer</td>
</tr>
</tbody>
</table>
The test system consists of four PLX82-EIP-61850 units transferring data between the IEC 61850 client (DTM tool) and the processor (1756-L81E). One Stratix switch connects to the IEC 61850 network, while another Stratix switch connects to the EtherNet/IP network. The Ethernet port that is connected to the 1756-L81E processor is mirrored so the personal computer can also monitor the EtherNet/IP data traffic. The personal computer captures the IEC 61850 and EtherNet/IP data traffic separately, which is merged through Wireshark.

### Configuration Overview

These sections discuss the configuration guidelines.

#### ProSoft Gateway

Each PLX82-EIP-61850 unit is configured to communicate with ten simulated SEL (Schweitzer Engineering Laboratories) IEDs according to the configured IED description (CID) files that support the PlantPAx® Rockwell Automation Library for Electrical Protection Devices faceplates. Figure 4 shows a sample configuration.
Each PLX82-EIP-61850 module is configured to read three reports and write eight controllable points from/to each IED. **Table 3** shows the breakdown of attributes from each device and their assignment to each report.

### Table 3 - Device Attributes

<table>
<thead>
<tr>
<th>IEC 61850 Communication Method</th>
<th>Mode</th>
<th>Dataset</th>
<th>Data Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Report</td>
<td>Buffered</td>
<td>DSet01</td>
<td>41 data attributes</td>
</tr>
<tr>
<td>Report</td>
<td>Buffered</td>
<td>DSet02</td>
<td>134 data attributes</td>
</tr>
<tr>
<td>Report</td>
<td>Buffered</td>
<td>DSet03</td>
<td>32 data attributes</td>
</tr>
<tr>
<td>Control</td>
<td>Direct/Norm</td>
<td>-</td>
<td>8 controllable points</td>
</tr>
</tbody>
</table>

### IEC 61850 Communication Overview

The DTM software simulates 40 IEDs based on the CID files from the Rockwell Automation Library for Electrical Protection Devices, publication **PROCES-RM011**. **Table 4** provides a configuration overview of the relevant CID settings and IEC 61850 data traffic that the DTM tool generates.

### Table 4 - Configuration Overview

<table>
<thead>
<tr>
<th>Communication Method</th>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffered Report</td>
<td>Count per IED</td>
<td>3</td>
</tr>
<tr>
<td>Buffered Report</td>
<td>Trigger Options</td>
<td>Data change (dchng) and Integrity Period (IntPd) (all reports)</td>
</tr>
<tr>
<td>Buffered Report</td>
<td>Integrity Period</td>
<td>DSet01: 1000 ms, DSet02: 5000 ms, DSet03: 1000 ms</td>
</tr>
<tr>
<td>Buffered Report</td>
<td>Data change frequency</td>
<td>25% of the data attributes change data every 30 seconds</td>
</tr>
<tr>
<td>Buffered Report</td>
<td>Buffer Time</td>
<td>500 ms (all reports)</td>
</tr>
<tr>
<td>Unbuffered Report</td>
<td>Count per IED</td>
<td>0</td>
</tr>
<tr>
<td>GOOSE control block</td>
<td>Count per IED</td>
<td>0</td>
</tr>
<tr>
<td>MMS read operation</td>
<td>Count per IED</td>
<td>0</td>
</tr>
<tr>
<td>Control</td>
<td>Count per IED</td>
<td>8 controllable points</td>
</tr>
<tr>
<td>Control</td>
<td>Operate frequency</td>
<td>Each control operation is issued every 1000 ms</td>
</tr>
</tbody>
</table>
**EtherNet/IP Configuration**

*Table 5* provides the information for the configuration of the EtherNet/IP network configuration for the ProSoft Gateway module within the integration unit.

*Table 5 - ProSoft Gateway Module EtherNet/IP Network Configuration*

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Connections (per EUT)</td>
<td>20</td>
</tr>
<tr>
<td>RPI</td>
<td>100 ms</td>
</tr>
<tr>
<td>Connection size</td>
<td>500 bytes input / 496 bytes output</td>
</tr>
<tr>
<td>Connection type</td>
<td>Unicast</td>
</tr>
</tbody>
</table>

**Test Requirements**

The following logic is written in the ControlLogix™ controller:

- Class 1 connection timeout - Monitor the number of timeouts for each connection during the testing period.
- Report data update timing - Measure the maximum time interval without data change.
- Control operation - Trigger eight control operations for each IED every 1000 ms.

**Evaluation Criteria**

*Table 6* shows the criteria that are used to evaluate a valid test of the system.

*Table 6 - Evaluation Criteria*

<table>
<thead>
<tr>
<th>Test Criteria</th>
<th>Pass Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>EtherNet/IP timeouts</td>
<td>No timeouts observed</td>
</tr>
<tr>
<td>EtherNet/IP jitter</td>
<td>Within 5% of the requested RPI time</td>
</tr>
<tr>
<td>Report timing</td>
<td>Change 25% of data every 30 seconds</td>
</tr>
<tr>
<td>Control timing</td>
<td>Trigger eight commands each device every 1 second</td>
</tr>
<tr>
<td>IEC 61850 TCP/IP timeouts</td>
<td>No timeouts that the EUT causes</td>
</tr>
</tbody>
</table>

**Test Results**

The following sections show the results for multi-module system and single module system testing.
**Multi-module System**

Figure 5 defines the system stability for a system that contains 10...40 IEDs. The points within the chart represent test data that, where the actual measured RPI time, between the ProSoft Gateway module and the ControlLogix controller, is within 5% of the configured RPI time. As multiple, fully loaded modules are added within the system, the system scales linearly.

**Figure 5 - System RPI Settings**
**Single Module System**

*Figure 6* defines the system stability for a system that contains between 1…10 IEDs. The points within the chart represent test data that, where the actual measured RPI time, between the ProSoft Gateway module and the ControlLogix controller, is within 5% of the configured RPI time. As IEDs are added to the module, the RPI response time scales linearly.

*Figure 6 - Loading of Single ProSoft PLX 82 Module*

See the IntelliCENTER Integration Unit Specifications Technical Data, publication 3300A-TD001 for specifications.

**Converged Plantwide Ethernet (CPwE) Guidelines For Connecting the IntelliCENTER IEC 61850 Integration Unit to PlantPAx Process Automation System**

The integration unit can be integrated into the PlantPAx distributed control system. The integration unit acts as another process skid or instrument to be connected into the overall PlantPAx architecture. The programmable controller within the integration unit is also considered like a remote terminal unit (RTU) within the process architecture. This information is directly produced to the HMI and the reporting layer while also producing the same data to other controllers for control operations within the system. For more information about the PlantPAx system architecture, consult the PlantPAx Distributed Control System Reference Manual, publication PROCES-RM001.
Figure 7 - System Architecture

The PlantPAx Distributed Control System is a modern DCS which is scalable, flexible, and open while providing the reliability, functionality, and performance expected from a DCS. The PlantPAx System is capable of integrating control systems on process skidded equipments, process instrumentation, intelligent motor control and intelligent electrical protection devices. This drawing depicts a typical reference architecture for the PlantPAx System.

Virtual LANs provide the proper automation system segregation, where the critical communication is in the same subnet.

Process Controllers responsible to handle Process I/O and Motor Control Center.

Intelligent Motor Control Devices

Process Control I/O Network

VLAN Segmentation Management (300)
Native - Trunk (301)
Supervisory Network (501)
MCC I/O Network (502)
Process I/O Network (503)
RTU I/O Network (504)
IEC 61850 Network (505)

Simplex Integration

When integrating into a simplex system, connect the uplink on the Stratix 5700 switch that is provided in the integration unit with the process level switch that is provided within the PlantPAx system architecture. Consult the PlantPAx Distributed Control System Reference Manual, publication PROCES-RM001 for further guidance on port configuration. See the Converged Plant-wide Ethernet (CPwE) Design and Implementation Guide, publication ENET-TD001 for network topology guidance.
Redundant Integration

When integrating into a redundant system, consider items including network architecture, controller size, and device ownership. Connect the uplink on the Stratix 5700 switch that is provided in the integration unit to the process level switch provided within the PlantPAx system architecture. Consult the PlantPAx Distributed Control System Reference Manual, publication PROCES-RM001 for further guidance on port configurations and controller sizing and impact for redundant systems. See the Converged Plant-wide Ethernet (CPwE) Design and Implementation Guide, publication ENET-TD001 for network topology guidance.
Notes:
Index

A
abbreviations 5
Add-on Profiles 5

C
configuration guidelines
ProSoft gateway 17
connect integration unit 13
controller 21
CompactLogix™ 9
ControlLogix® 9
converged plantwide Ethernet system See CPwE
CPwE
connect integration unit 21
redundant system 23
simplex system 22

D
DCS 9

F
faceplates 8

G
gateway 13, 17
GOOSE subscriber functionality 14

I
IEC 61850 gateway 10, 13
IEC 61850 network 13
IED 13, 15
IEEE C37.238 14
industrial Ethernet switch
managed 10
Integrated Architecture® 9
integrated power and automation See IPA
integration unit 8, 9, 13
intelligent electrical devices See IED
IPA 7

L
layer 2 switch 10

M
managed Ethernet switch 10
advanced security 10
diagnostics 10
network management 10
MMS client configuration 14

N
network segmentation 13

O
operator interface 11

P
PlantPAx® system 9
process object library 8
programmable controller 9

Q
quality of service 14

R
redundant system 23
Resilient Ethernet Protocol 10
RPI time 20, 21

S
simplex system 22
size guidelines 15

test guidelines 15

terminal 5
test guidelines 15

terminology 5
test guidelines 15

test results
RPI time 20, 21
time synchronization 14
trusted network 13

trusted network 13

Index

**U**
unified architecture 8, 13
untrusted network 10
uplink 22

**V**
Virtual LAN 10
VLAN 14

**W**
WAN 10
### Rockwell Automation Support

Use the following resources to access support information.

<table>
<thead>
<tr>
<th>Technical Support Center</th>
<th>Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.</th>
<th><a href="https://rockwellautomation.custhelp.com/">https://rockwellautomation.custhelp.com/</a></th>
</tr>
</thead>
</table>

### Documentation Feedback


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