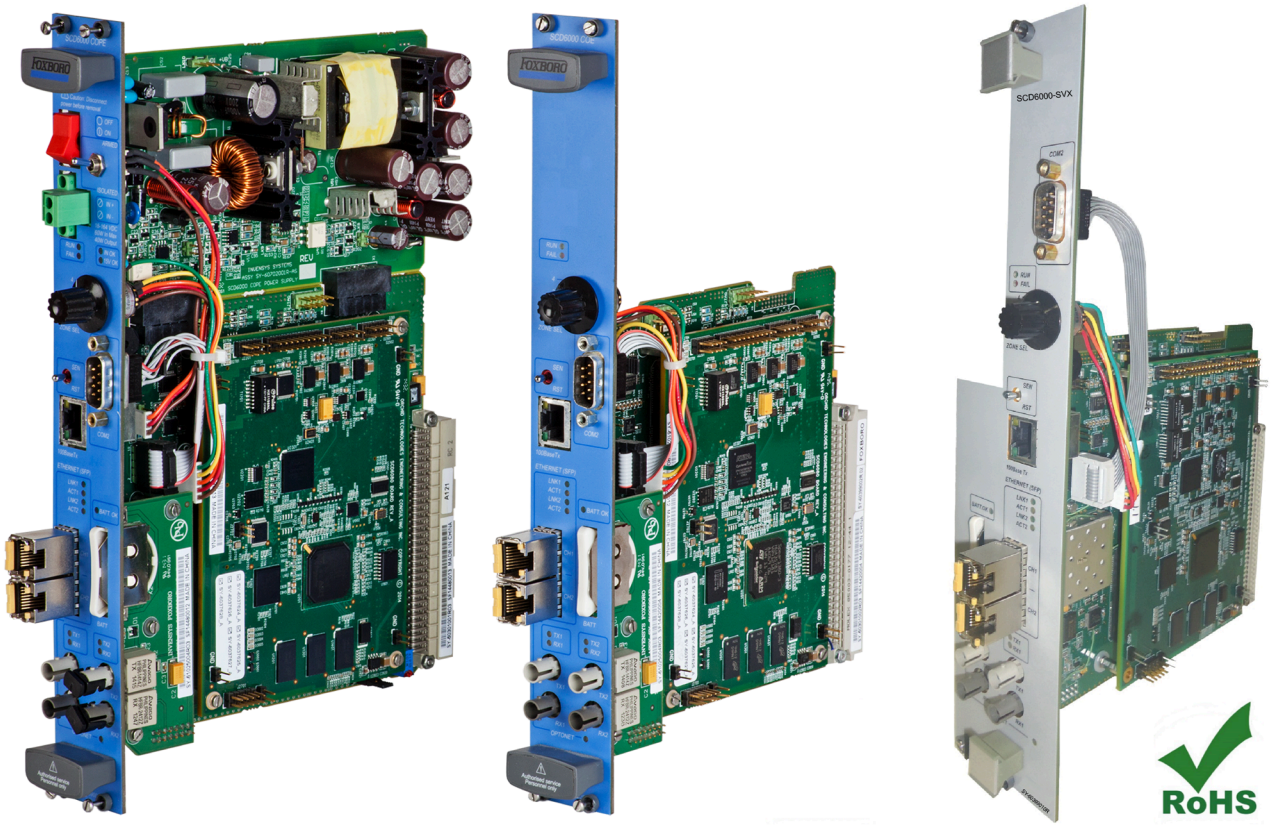
Foxboro™ SCADA

SCD6000 CPU Modules

PSS 41H-8S6KCPU

Product Specification

April 2024



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This document is not intended as a substitute for a detailed study or operational and site-specific development or schematic plan. It is not to be used for determining suitability or reliability of the products/solutions for specific user applications. It is the duty of any such user to perform or have any professional expert of its choice (integrator, specifier or the like) perform the appropriate and comprehensive risk analysis, evaluation and testing of the products/solutions with respect to the relevant specific application or use thereof.

Overview

EcoStruxure™ Foxboro™ SCADA SCD6000 is a Station Computing Device (SCD), commonly referred to as a Remote Terminal Unit (RTU). It helps enable process automation in the SCADA systems by providing remote (long-distance and high-integrity) communications. SCD6000 COPE (CPU/OptoNet/Power Supply/Ethernet Module), COE (CPU/OptoNet/Ethernet Module), and EcoStruxure™ Foxboro™ SCADA SCD6000-SVX COE are referred to as SCD6000 CPU modules unless stated explicitly.

The SCD6000 CPU modules inherit functionality from the Foxboro SCADA SCD5200 CPU modules and provide more dynamic RAM for a higher concentration of IEC 61850 IEDs. They can be used as a plug-in replacement for the existing SCD5200 CPU module installed base with a regenerated configuration file. The SCD6000-SVX module is used with the SCD6000-IOX card file and inherits the functionality of the P3OE module. The available types of SCD6000 CPU modules are:

- CPU, OptoNet, Power supply, and Ethernet (COPE variant) module that supply backplane power. These are preferred in the smaller file formats (up to 5 I/O modules) to avoid the need for a separate wide range power supply.
- CPU, OptoNet, and Ethernet (COE variant) module, which require a separate wide range power supply module, is preferred in the larger 19" (10-slot) card files.
- The SCD6000-SVX variant, which requires a separate wide range power supply, is preferred in the larger 19" (6-slot and 7-slot) card file.

SCD6000 consist of a series of building blocks and provide a variety of modules and card file variations to help you build a SCADA system that suits your needs. For more information, see *EcoStruxure™ Foxboro™ SCADA SCD6000 RTU Architectural Overview* (PSS 41H-8S6KAOV).

Modularity is the key feature of the SCD6000. The CPU module consists of a high-speed board and a carrier board, which are integrated into a compact main processor board. For SCD6000 CPU modules, a Power Supply board (COPE) is also provided as an add-on board. In a distributed station computing device network, the SCD6000 CPU module is the heart of each node, and each SCD6000 CPU node manages its associated database, communication, and local applications. When utilized as a Data Control and Interchange Unit (DCIU), the SCD6000 CPU module provides:

- Data concentration capability
- SCADA communications
- Communications to Intelligent Electronic Devices (IEDs) over various communication channels, including RS-232/RS-485 and TCP/IP

With its on-board OptoNet fiber optic network connectivity, the SCD6000 CPU module helps support high performance and consistent peer-to-peer communications between the nodes.

Insensitive Terms Replaced in this Document

We have replaced these terms in this document. However, the product's user interface and ordering information might still use old terms.

Old Term	New Term
Master station	Client station
DNP3 Master	DNP3 Controlling station
DNP3 Slave	DNP3 Outstation
Modbus Master	Modbus Client
Modbus Slave	Modbus Server
Slave	Server
IEC 60870-5-104 (Master and Slave)	IEC 60870-5-104 (Client and Server)
Modbus/TCP (Master and Slave)	Modbus TCP (Client and Server)

Applications of SCD6000

You can configure SCD6000 modules as an IEC 61850 gateway or controller. The configurations are described in:

- SCD6000 IEC 61850 Gateway, page 4
- SCD6000 Controller, page 6
- SCD6000 Translator, page 8
- Electrodynamic Controller, page 9

You can also configure SCD6000 module as an Automatic Transfer Switch (ATS). See Automatic Transfer Switch Functionality, page 9.

SCD6000 IEC 61850 Gateway

SCD6000 IEC 61850 Gateway is a configuration of the SCD6000 product. It provides an easy introduction path to the IEC 61850 field device, reducing the impact on a SCADA control center that is already installed and uses the DNP3 protocol.

As part of the overall SCD6000 product line, the SCD6000 IEC 61850 Gateway has advanced data integration, time synchronization, and programming capabilities. Its primary server interfaces are provided with the DNP3 Outstation (TCP/IP and Serial) and IEC 61850 Client.

The SCD6000 IEC 61850 Gateway uses these protocols to communicate and integrate with multiple remote primary control centers.

Each SCD6000 rack-mounted card file can support Power, CPU, Serial, and Ethernet Communication ports.

The architecture provides continuous support for OptoNet and includes additional support for the high speed internet protocols that are needed to integrate IEC 61850 Station LANs. The OptoNet is transparent to the user and provides the user programming environment access to any I/O or communications information on any node at any time.

Up to 63 RTUs can be interconnected on the OptoNet ring. Backward compatibility of the OptoNet is maintained with the Foxboro Remote Terminal Unit RTU50. This allows you to include a mix of older RTU50/SCD5200 nodes with the newer SCD6000 nodes.

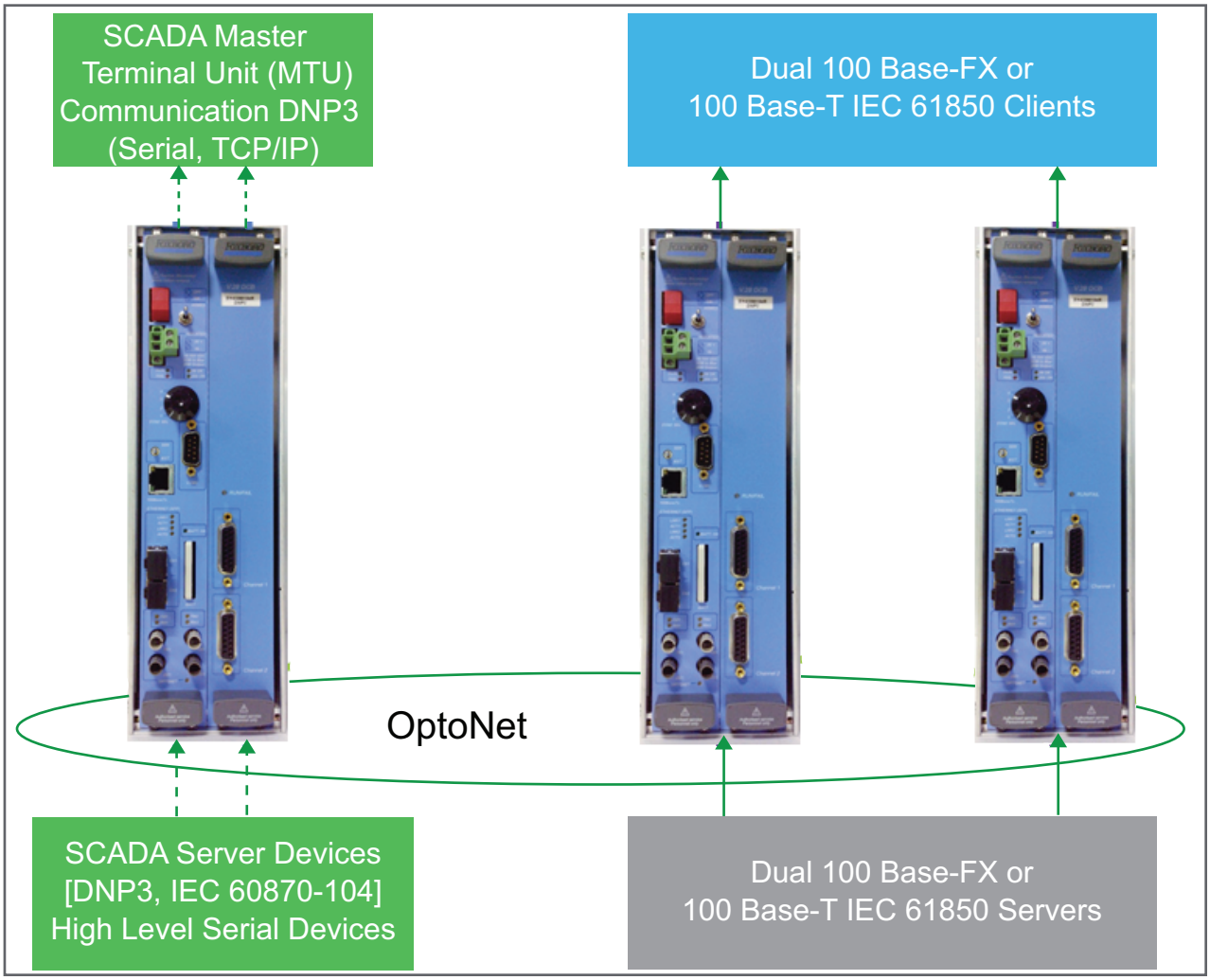
IEC 61850 Station LANs can be introduced into any node on either of the Dual SFP based Ethernet ports and RJ45 Ethernet Port.

The SCD6000 can be password protected on any TCP/IP or Serial port to restrict end user access. Passwords can be assigned for individual users and common roles such as Maintain, Browse, and Superuser.

The SCD6000 IEC 61850 Gateway includes both IEC 61850 Client and Server services and data structures. These data structures are created by importing a standard .scd file format and are included with the configuration file. Either the IEC 61850 Client or Server or both can be configured for use on any node.

This image shows the IEC 61850 protocol data being exported to another RTU through the OptoNet network. The exported IEC 61850 data is transferred to upstream devices through other SCADA protocols.

Figure 1 - IEC 61850 Gateway



SCD6000 Controller

The SCD6000 architecture is designed with the flexibility to allow users to configure Foxboro SCADA Remote Terminal Unit (RTU)s as needed to meet the various Control System requirements. The same equipment, software, and networks are used as building blocks to produce a fully integrated system consisting of:

- Analog, digital, or fiber-optic communications using multiple communication ports with each port using different communication protocols
- Intelligent I/O modules for high performance processing
- High speed peer-to-peer distributed automation over a ring optical network
- Integration of Intelligent Electronic Devices (IEDs) within the local control network
- Data and Control Interface Unit (DCIU) capability for coordination of controls between RTUs
- “Check-before-operate” mechanism on all controls
- Applications Software Library for a wide range of control system applications

SCD6000 is a multi-nodal RTU with advanced data integration, time synchronization, and programming capabilities. Its primary server interfaces are provided with DNP3 Outstation (TCP/IP and Serial) and IEC 61850 Client.

Each SCD6000 rack-mounted card file can support power, CPU, communication, and I/O modules. The range of I/O modules is extensive, covering all aspects of I/O at a wide range of input voltage level. Each I/O processor is intelligent, provides on-board pre-processing, and captures information on the Sequence of Events.

Apart from handling I/O modules, the SCD6000 also works as an embedded computing and networking platform, which serves as a distributed Station Computing Device (SCD).

As shown in the SCD6000 Controller figure, the architecture provides continuous support for OptoNet and includes additional support for the high speed internet protocols that are needed to integrate IEC 61850 Station LANs. OptoNet is transparent to the user and it provides a user programming environment with access to I/O or communication information on any node at any time. Up to 63 SCD6000s can be interconnected on the OptoNet ring. IEC 61850 Station LANs can be introduced into any node on either of the dual SFP based Ethernet ports and RJ45 Ethernet Port.

Backward compatibility of the OptoNet is maintained with the Foxboro Remote Terminal Unit RTU50/SCD5200. This allows older RTU50/SCD5200 card files to be mixed with the newer SCD6000 card.

SCD6000 supports both half and full duplex Ethernet communication. Dual SFP ports support either 100Base-FX or 10/100Base-T and provide a cost effective and versatile optical, and wired Ethernet interface. Electrodynamic Controller applications support only fiber optic 100Base-FX (SY-6038090) for control network connections.

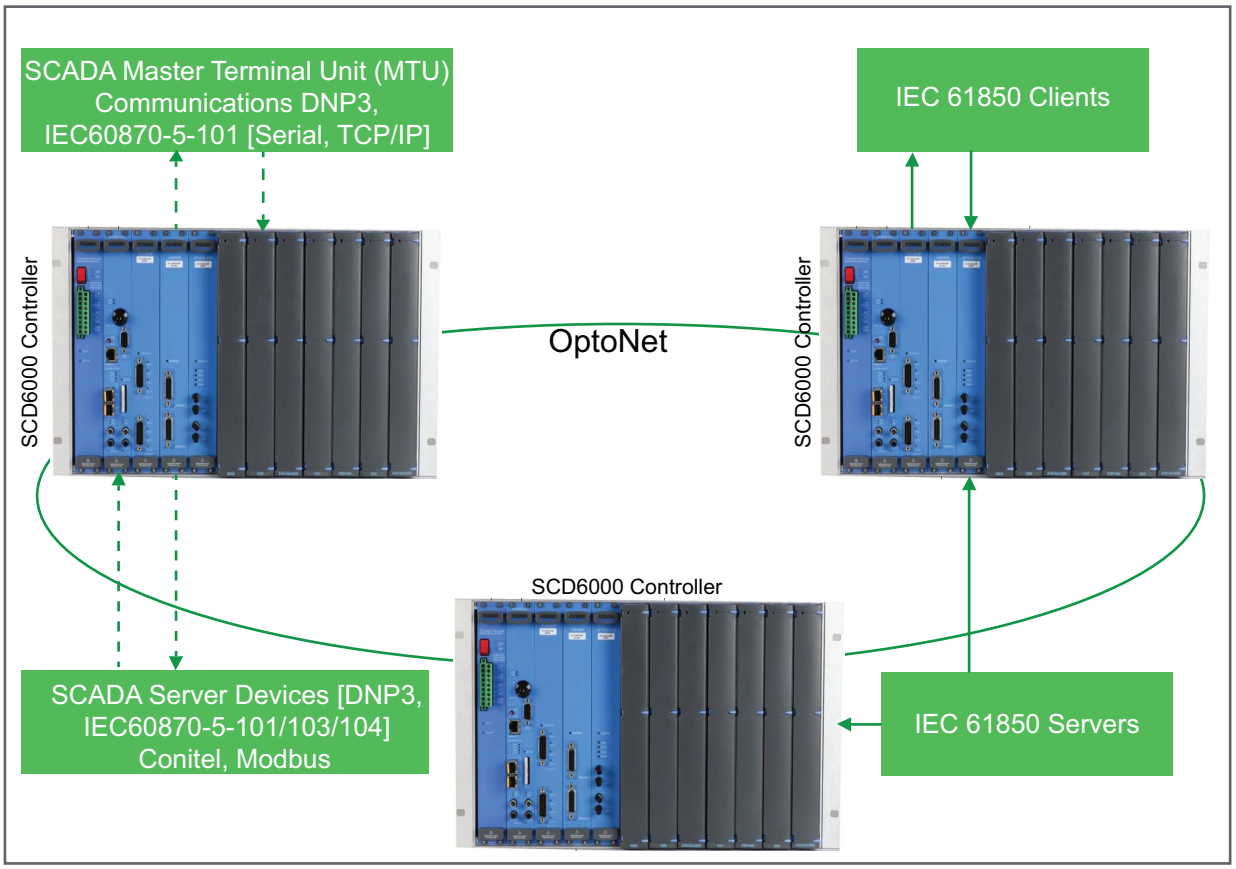
The SCD6000 Controller includes both IEC 61850 Client and Server services, and data structures. These data structures are created by importing a standard .scd file included with the configuration file. Either the IEC 61850 Client or Server, or both can be configured for use on any node.

The SCD6000 controller has the ability to update online parameters communication protocols, so that the user need not restart the RTU if certain parameters such as delays and timeouts are changed.

Control Points now have the last five control events with Request Time, Operate Time, Value, and CE Flag.

This image shows the IEC 61850 Client and Server protocol data being exported to another RTU through the OptoNet network. The exported IEC 61850 data is transferred to upstream devices through the SCADA protocol and vice versa.

Figure 2 - SCD6000 Controller



SCD6000 Translator

SCD6000 Translator is a configuration of the SCD6000 product. It enables the translation of multiple low level communications protocols and physical media types to one or more high level protocols, for example, to a Modbus IEC 61850 translation.

Any SCD6000 node can be an IEC 61850 Client or an IEC 61850 Server, or both simultaneously.

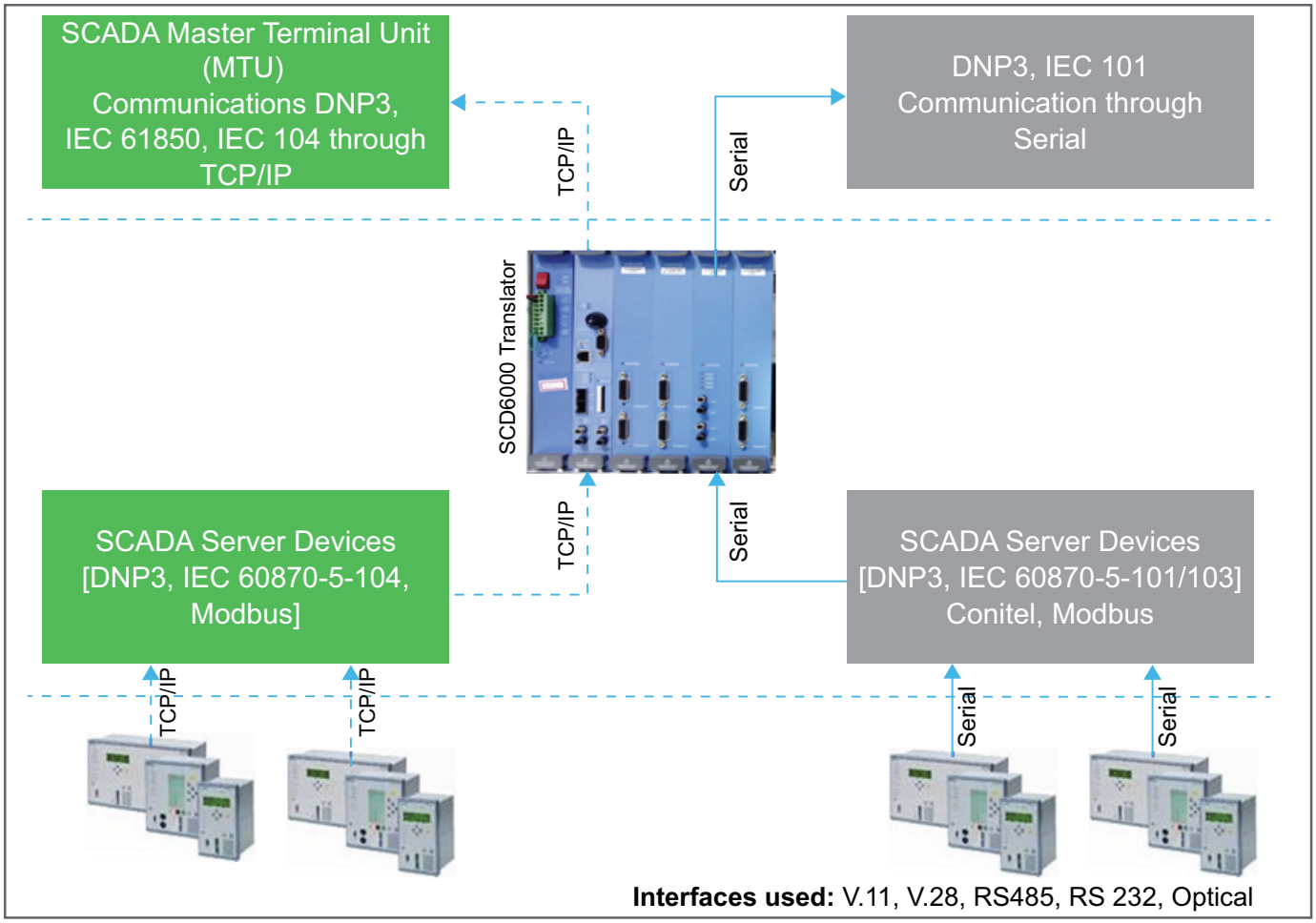
DNP3 SAv2 and SAv5 protocol were added to the SCD6000 translator with firmware version D or later. This feature needs a change in firmware of the DCB modules and this feature cannot be retrofitted to the SCD6000 without replacing the associated DCB modules.

The SCD6000 translator has the ability to update online parameters for communication protocols, which avoids restart of the RTU if certain parameters such as trusted hosts, delays, and timeouts are changed.

Control Points store the last 5 control events with Request time, Operate Time, Value, and CE Flag.

This image shows the SCD6000 receiving data from serial slave devices and transferring it to upstream devices through the TCP/IP interface.

Figure 3 - Translator



Electrodynamic Controller

The EcoStruxure™ Electrodynamic Controller is a configuration of SCD6000. It is a control station that is part of the EcoStruxure Power and Process Control System, which includes the EcoStruxure Foxboro™ Distributed Control System (DCS) and the EcoStruxure Power Automation System.

The EcoStruxure Power and Process Control System connects the process control domain and the electrical control domain, allowing operators to see conditions that might compromise the electrical distribution network before a process is started and identify how measures, such as Intelligent Fast Load Shedding (iFLS), might impact a process. The Electrodynamic Controller is at the center of this system, facilitating the integration of power systems and Intelligent Electronic Devices (IEDs).

Device integration includes interfacing IEDs, gathering IED data, and sending that data to user interfaces (UI). During this process, the Electrodynamic Controller performs internal regulatory, logic, timing, and sequential control, supports alarm detection and notification, and allows for sequence of events (SOE) notification. The Electrodynamic Controller also acts as a compound block processor, integrates with multi-protocol data feeds, and incorporates key power load control and integration strategies.

The Electrodynamic Controller can be used in both simplex and high availability configurations. While these configurations provide similar monitoring and control functionality, high availability also provides redundant control mechanisms that support Foxboro™ DCS Control Network redundancy and various forms of electrical network redundancy. High availability also allows for softwired load management on the DCS through TCP/IP connectivity instead of hardwired input/output (I/O).

For more information on the Electrodynamic Controller, see *EcoStruxure™ Electrodynamic Controller* Product Specification (PSS 41S-2EDC).

Automatic Transfer Switch Functionality

SCD6000 supports ATS functionality when used with Current Transducer, Voltage Transducer (CTVT) modules and State and Logic Language (SALL) based configuration. This ATS function monitors voltage, frequency, and phase of the electrical networks and sends signals to the circuit breaker switching control application.

To enable this functionality, use these components with an SCD6000 card file to configure an ATS and connect it to the RTU or an Electrodynamic Controller:

- Four 3-phase sync-check CTVT modules and two built-in digital I/O on the CTVT module for the physical ATS
- IED system that uses three circuit breakers and breaker status supervision
- SALL configuration customized for ATS
- RTU firmware (SY-1101207_R1 and later) and CTVT firmware (SY-1037595_F and later) for sync check to perform power supply transfer

For information on how to configure the AC Transducer Type 2 Module and SCD6000 for ATS functionality, see *EcoStruxure™ Foxboro™ SCADA RTU AC Transducer Module - Type 2 User's Guide* (B0780DV) and *EcoStruxure™ Foxboro™ SCADA RTU Station (Foxboro SCADA Remote Devices and RTU50) User's Guide* (B0780DQ).

For information on how to engineer the ATS system, contact Global Customer Support at https://pasupport.se.com (registration required).

Features

CPU Features

- Dual core ARM Cortex A9 SoC
- 256 MB DDR3 SDRAM for SY-60399001R, SY-60399002R, SY-60399010R
- 1 GB DDR3 SDRAM for SY-60399008R, SY-60399009R, SY-60399012R
- 256 KB non-volatile RAM memory
- 16 MB protected mode BIOS
- 64 MB Internal Flash Storage
- RJ-45 Ethernet port for diagnostics
- Watchdog timer
- RS-232/RS-485 programmable serial port
- Two SFP receptacles allow to plug in either a fiber SFP with a support of 100 Base FX or a copper SFP with a support of 10/100 Base-T.

  Electrodynamic Controller applications support only fiber SFPs (SY-6038090).
- Real-time calendar clock
- 7-year battery backup
- ACT/SBY (Active/Standby) LED indicators for SY-60399008R and SY-60399009R

OptoNet Features

- Deterministic, token-passing network protocol
- Dual ring network, with up to 63 nodes per network
- Total network length up to 3.6 miles (5.8 km), maximum of 1640 feet (500 m) between nodes
- Optical fiber (multi-mode glass) cables
- Fault tolerant to a single point of detected failure
- High-speed data transfer
- Enables distributed data
- I/O data available to all nodes
- Convenient low cost ST Tx and Rx connector
- In Electrodynamic Controller high availability configurations, the OptoNet ports are used to establish a connection between the active and standby controllers. For more information, see *EcoStruxure™ Electrodynamic Controller* Product Specification (PSS 41S-2EDC).

Power Supply Features (COPE Only)

- Wide range input supply: 19.2 V to 148 VDC
- 40 W output capacity
- Compact high efficiency switch design
- Exhibits 4 ms hold up time with shorted input power

- Withstands 10 ms open circuit power input
- Over-current and over/under voltage protection
- Front panel LEDs to monitor input supply and internal voltage
- On-board power supply is disconnected when external Wide Range Input Power Supply module is used. For more information, see *EcoStruxure™ Foxboro™ SCADA SCD6000 and SCD6000-SVX Power Supply, I/O, and Communication Modules* (PSS 41H-8S6KMOD).

Ethernet Features

- Half/full duplex communications.
- Two SFP ports provide link and activity indications for each channel and support either 100 Base-FX or 10/100 Base-T modules.

  Electrodynamic Controller applications support only fiber 100 Base-FX SFP modules (SY-6038090).
- One port that supports 10/100 Base-T Ethernet interface on RJ-45.

Functional Description

CPU

The SCD6000 CPU module is a combination of a high-speed CPU board and a carrier board. The high-speed CPU board has a SPEAr1380 Processor with 2 X ARM cortex A9 cores, supporting a frequency of 600 MHz.

The carrier board has three Ethernet ports. Two of the ports are SFP ports that support pluggable 100 Base-FX or 10/100 Base-T interface modules. The third port supports a 10/100 Base-T Ethernet interface on an RJ-45 connector. Electrodynamic Controller applications support only fiber 100 Base-FX SFP modules (SY-6038090).

A serial port, which can be linked to RS-232 or RS-485, is available for interfacing with IEDs or for communicating with a SCADA Client Station. In Electrodynamic Controller applications, the serial port can be used to share data between the active and standby controllers. This port supports industrial standard DNP3 Outstation, DNP3 Controlling station, Modbus Server, and Modbus Client Protocols. It allows the implementation of proprietary protocols through the State And Logic Language High Level Serial Interface (SALL HLSI). For more information, see *EcoStruxure™ Foxboro™ SCADA SCD6000 State And Logic Language (SALL)* (PSS 41S-2S6KSAL). The serial port supports logging of Sequence Of Events (SOE) to a printer or a terminal.

OptoNet

OptoNet on the SCD6000 CPU module is controlled from a single ARCNET network controller. The two external ports are logically and physically identical. Port A and Port B can be connected to neighboring RTUs. These ports are half duplex ports that can transmit and receive individually. Therefore, they create two effective "rings".

The network is automatically configured at start-up by the RTU host processors that assign themselves network addresses according to their OptoNet node number.

The ARCNET controller is the only local intelligence on the OptoNet node modules and the RTU host processors direct the network activity. The ARCNET controller chips manage all the housekeeping tasks such as passing tokens, acknowledging messages, and detecting errors.

In Electrodynamic Controller high availability configurations, the OptoNet and serial connection ports are used to communicate, synchronize, and share data between the active and standby controllers. For more information, see *EcoStruxure™ Electrodynamic Controller* Product Specification (PSS 41S-2EDC).

Power Supply (COPE Only)

The COPE and COE variants of the SCD6000 CPU board are powered differently.

- The COPE variant is powered by its Power Supply board
- The COE variant is powered by the backplane that in turn is powered by a standalone Power Supply module

The wide input range (19.2 V to 148 VDC) of the Power Supply subsystem allows the SCD to be powered from 24 V, 48 V, or 129 VDC nominal power sources.

The Power Supply has a switched mode design that minimizes the size and weight of the Power Supply module and offers high power conversion.

The Power Supply subsystem supplies power up to 40 W.

If suitable operating voltages are not available, built-in voltage monitors hold the SCD in reset mode. A wide range 65 W Power Supply module is used to power a larger card file configuration using the COPE or the COE module. For more information, see *EcoStruxure™ Foxboro™ SCADA SCD6000 and SCD6000-SVX Power Supply, I/O, and Communication Modules* (PSS 41H-8S6KMOD).

Ethernet

The SCD6000 CPU module supports both half-duplex and full-duplex operations on Ethernet.

The Ethernet ports support communication with the client station(s) or TCP/IP enabled IEDs. Through TCP/IP, the Ethernet ports can also connect to RTV. For more details, see *EcoStruxure™ Foxboro™ SCADA RTU Station, RTV, and RTU Connect Secure Software* (PSS 41S-2S6KSWR). The Ethernet ports can simultaneously support a maximum of 200 TCP/IP connections.

The SCD6000 CPU module features these Ethernet ports:

- Two SFP ports to support either 100 Base-FX or 10/100 Base-T interface modules.

  Electrodynamic Controller applications support only fiber 100 Base-FX SFP modules (SY-6038090).

  The SFP Ethernet ports provide a cost-effective and versatile fiber optic or copper Ethernet interface for the CPU. The optical interface maintains high electrical isolation. Diagnostic LEDs provide link and activity indications for each SFP Ethernet channel.

- One 10/100 Base-T Ethernet port on RJ-45 connector.

  The Ethernet port for RJ-45 is used for EcoStruxure™ Foxboro™ SCADA Remote Terminal Viewer (RTV) connectivity. Diagnostic LEDs provide activity and link indications for this Ethernet port.

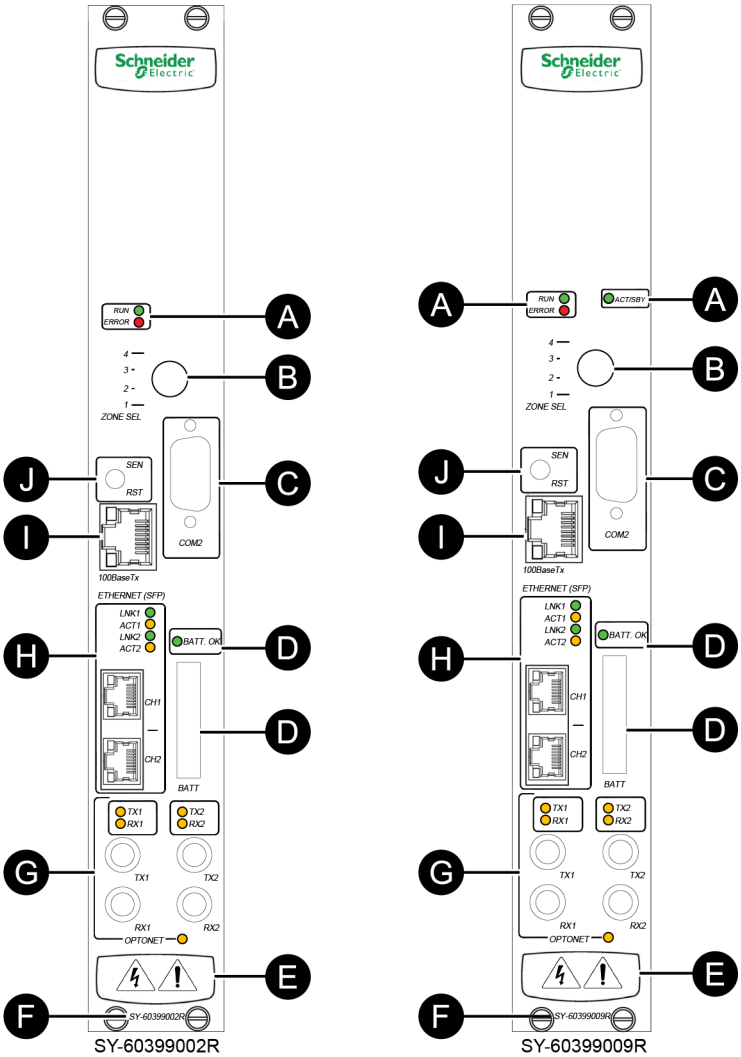
For Electrodynamic Controller applications, the Ethernet ports with fiber SFPs are used to enable communications with the Foxboro DCS Control Network and share diagnostics data via RTV. For more information, see *EcoStruxure™ Electrodynamic Controller* Product Specification (PSS 41S-2EDC).

Functional Specifications

Functional Specifications for CPU

Processor	SPEAr1380 (Dual Core ARM Cortex-A9 at 600 MHz)
Operating System	VxWorks®
BIOS	Foxboro protected mode
Memory System	256 MB DDR3 SDRAM for SY-60399001R, SY-60399002R, SY-60399010R 1 GB DDR3 SDRAM for SY-60399008R, SY-60399009R, SY-60399012R 16 MB Flash BIOS 64 MB Flash file storage 256 KB Non-volatile RAM
Peripheral Controllers	16550 type UARTs integrated with CPU DP83620/DP83640 Ethernet controllers COM20022 ARCNET controller
Bus Specifications	Foxboro Electrobus
Watchdog Timer	1 second timeout to reset the CPU
Front Panel	Power ON/OFF switch Control/Isolate toggle switch Control Selector Switch SEN/RST (Sense/Reset) switch Status LED ACT/SBY LED (for SY-60399008R and SY-60399009R) Two SFP ports One RJ45 Ethernet port Two OptoNet channel ports One RS-232/RS-485 Serial port
Serial Ports	One RS-232/RS-485 Serial port DB9 plug sockets wired per TIA/EIA-574 (DTE) RS-232/RS-485 (2- or 4-wire) link selectable • Provides general purpose user configurable communications port Supported Protocols: • Modbus Client • Modbus Server • DNP3 (Controlling Station and Outstation) (SAv2 and SAv5) • DNP3 Controlling Station Dialup (SAv2 and SAv5) • IEC 60870-5-101 Controlling Station • SALL HLSI (Generic configurable protocol interface) • GPS Clock (such as NEMA, Tekron, and TrueTime)

	• Diagnostic server and router • Terminal server • Event Logger
Real-Time Clock n:	AT compatible IBM computer, with 7.5 ppm accuracy, also provides Electrobus synchronizing and SOE clocks.
Backup Time	Real-time clock and non-volatile RAM are maintained during power outage via a replaceable lithium battery. The battery lasts 1 year in storage and 7 years in use. An LED and a parameter in RTV indicate when the battery is low.
User Authentication	• Password-based authentication for RTV connectivity • Three user privilege levels: Superuser, Maintenance, and Browse • Log of 500 most recent user activities in .CSV format for audit trails • Encrypted communication with RTV if the user authentication feature is enabled • System Use Notification message • Ethernet supported server protocols communication restricted to the configured Trusted hosts



SY-60399002R SY-60399009R

A	Diagnostic LEDs
B	Control Zone Selector Switch
C	Serial Communication Port
D	BATT and BATT. OK Indication
E	Safety Labels
F	Part Identification Number (SY-60399002R/SY-60399009R)
G	OptoNet Port 1 and Port 2
H	Dual Ethernet Ports
I	Diagnostic Ethernet Interface
J	Sense/Reset Momentary Toggle Switch

Functional Specifications for OptoNet

Configuration	Dual, counter-rotating ARCNET optical ring arrangement
Interface	Transmit Power • -12 dBm Receive Level • -27 dBm at bit error rate of 10^{-9}
Ports	Two optical ports each containing a transmit channel and a receive channel support a dual ring ARCNET configuration.
Maximum Length Between Nodes	1640 feet (500 meters)
Maximum Size of OptoNet Network Ring	Up to 12 nodes • 19029 feet (5800 meters) For 12 to 63 nodes • 6280 - [40 x Number of nodes] meters
Optical Cable	Glass fiber, multi-mode, 820 nm wavelength, dual 50/125 mm or 62.5/125 mm, ST connectors
Indicators	• 2 LEDs per port indicating link and activity • 2 LEDs per port indicating Tx and Rx status • 1 LED for indicating OptoNet communication

NOTE: In Electrodynamic Controller high availability configurations, the OptoNet and serial connection ports are used to communicate, synchronize, and share data between the active and standby controllers. For more information, see *EcoStruxure™ Electrodynamic Controller* Product Specification (PSS 41S-2EDC).

Functional Specifications for Power Supply Board

Power Requirements	• Maximum Power Input: 60 W • Maximum Power Output: 40 W
Input Voltage	Wide range 19.2 V to 148 VDC
Current Limit	Shut down at maximum power with auto-recovery
Over-Voltage Protection	Crowbar protection on +5 V
Under-Voltage Protection	Shut down at low input voltage
Hold-up Time	• Exhibits 4 ms hold up time with shorted input power • Exhibits 10 ms hold up time with open input power
Ripple and Noise	• 50 mV peak-to-peak (+5 V) • 100 mV peak-to-peak (±15 V)
Output	• +5 V at 4.5 A • +15 V at 1.0 A • –15 V at 0.15 A
Maximum Input Current	• 3.3 A at 18 V • 0.34 A at 164 V
Efficiency	> 65% at full load
Isolation	2000 VAC RMS for 1 minute Primary to Chassis and Primary to Secondary isolation

Functional Specifications for Ethernet

SFP Fiber Interface[a]	Transmit Power • -15.7 dBm Receive Level • - 31 dBm at bit error rate of 10^{-10} Range • 1.2 miles (2 km)
Ports	Two SFP ports to support either 100 Base-FX or 10/100 Base-T (Electrodynamic Controller applications support only fiber 100 Base-FX SFP modules (SY-6038090)) One RJ-45 port to support 10/100 Base-T
Supported Protocols	• DNP3 (Controlling Station and Outstation) (SAv2 and SAv5) • DNP3 (Controlling Station and Outstation) on TCP/IP (SAv2 and SAv5) • DNP3 (Controlling Station and Outstation) on UDP (SAv2 and SAv5) • IEC 60870-5-104 (Client and Server) • IEC 61850 Edition 2.1 GOOSE Publisher and Subscriber • DNV GL certified IEC 61850 Edition 2.1 Server and 2.0 Client • DNV GL certified IEC 61850 Edition 1 Server and Client • DNV GL certified IEC 61850 Edition 1 GOOSE Publisher and Subscriber • IEC 60870-5-101 Client • Modbus/TCP (Client and Server) • Diagnostic Utility over TCP/IP • IEEE 1588 Precision Time Protocol (PTP) Master and Slave • SNTP (Client, Server and Client/Server)
Optical Cable	Glass fiber, multi-mode, 1310 nm wavelength, dual 50/125 or 62.5/125 µm, LC connector
Indicators	2 LEDs per port indicating link and activity
(a) Copper and Fiber SFP modules must be ordered separately. See Ordering Information, page 36. **NOTE:** AT-FS201 from the Allied Telesis is a preferred media converter.	

Card File Formats

Configuration Type	Card File Formats
Gateway	• Multi-slot card file formats: The SCD6000 IEC 61850 Gateway does not support communication and I/O modules. We recommend these card files for the SCD6000 IEC 61850 Gateway: ◦ 2 x 5 slot file ◦ 3 x 3 slot file ◦ 6 x 1 slot file • Single-slot card file format: With the advent of the IEC 61850 Server or Client, the SCD6000 can act as a data-concentrator with all external interaction occurring on the dual Ethernet ports. The single slot card file is most appropriate in these cases.
Translator	Multi-slot card file formats: The SCD6000 is provided with a passive parallel backplane that makes it possible to provide many formats with a varying number of DCB slots. Higher communications densities can be accommodated using the 5-slot card file. In this case, a COPE [variant of the CPU module] supplies backplane power that avoids the need for a separate wide range power supply. This 5-slot file can be located in smaller spaces where a 19 inch rack solution might not be feasible.
Controller	For the controller card file variations, see SCD6000 Card File Variations, page 20 and SCD6000-SVX Card File Variations, page 20.
Electrodynamic Controller	The Electrodynamic Controller does not support communication modules. You can use these multi-slot card files: • 10 I/O slot file • 2 x 5 I/O slot file • 6 x 1 I/O slot file For more information, see *EcoStruxure™ Electrodynamic Controller* Product Specification (PSS 41S-2EDC).

SCD6000 Card File Variations

The SCD6000 is provided with a passive high speed backplane that makes it possible to provide a number of formats with varying number of I/O slots. The SCD6000 supports four standard file variations:

- 10- I/O slot card file
- 5- I/O slot card file
- 3- I/O slot card file
- 1- I/O slot card file

Some more card file variant combinations are:

- 2x5 I/O slot card file
- 3x3 I/O slot card file
- 6x1 I/O slot card file

Each variation allows one CPU. The most popular card format for the SCD6000 is a 19" 10 I/O slot card file, which includes a wide range power supply, a COE (CPU, OptoNet, and Ethernet) variant of the COPE module (CPU, OptoNet, Power Supply, and Ethernet), and space to accommodate up to 10 standard width I/O modules.

You can use OptoNet cables to interconnect each card file to allow a scalable solution involving multiple computing nodes. Use the 5 I/O slot, 3 I/O slot, and one I/O slot card files for smaller spaces where a 19" card file solution might not be feasible. In this case, a COPE (CPU, OptoNet, Power supply, and Ethernet) variant of the CPU module supplies backplane power, which avoids the need for a separate power supply. For more information, see *EcoStruxure™ Foxboro™ SCADA SCD6000 Hardware User's Guide* (B0780DW).

SCD6000-SVX Card File Variations

Similar to SCD6000, SCD6000-SVX is provided with a passive high speed backplane that makes it possible to provide different formats with varying number of I/O slots. The SCD6000-SVX supports two standard file variations:

- 7 slot card file
- 6 slot card file

Each variation allows one CPU. The most popular card format for the SCD6000-SVX is also a 19" rack file, which includes a wide range power supply, a CPU module, and space to accommodate up to 5 I/O or Communication modules.

You can use OptoNet cables to interconnect each card file to allow a scalable solution involving multiple computing nodes. For more information, see *EcoStruxure™ Foxboro™ SCADA SCD6000-SVX and RTU50 SVX Hardware User's Guide* (B0780EQ).

Performance Characteristics

SCD6000 Controller Performance Characteristics

For Electrodynamic Controller performance characteristics, see *EcoStruxure™ Electrodynamic Controller* Product Specification (PSS 41S-2EDC).

Table 1 - IEC 61850 Server

No. of Logical Nodes	Data Attributes	CPU0[a] Configuration		CPU1[b] Configuration		Startup Time (in seconds)	RAM Usage (in MB)
		CPU0 Idle %	CPU1 Idle %	CPU0 Idle %	CPU1 Idle %		
10 (With Modbus)	960	96	94	98	99	56	162
16 (With Modbus)	1520	96	89	98	99	59	164
32 (With Modbus)	3040	94	85	98	96	59	168
64 (With Modbus)	6080	94	86	98	91	60	177
125 (With Modbus)	12000	93	85	98	84	63	195
250 (With Modbus)	24000	91	90	97	74	82	229
(a) IEC 61850 Server configuration is running on CPU0. (b) IEC 61850 Server configuration is running on CPU1.							

Table 2 - IEC 61850 Client

No. of Logical Nodes	Data Attributes	CPU0[a] Configuration		CPU1[b] Configuration		Startup Time (in seconds)	RAM Usage (in MB)
		CPU0 Idle %	CPU1 Idle %	CPU0 Idle %	CPU1 Idle %		
10 (Without DNP3 Outstation)	960	96	92	98	93	60–82	156–157
10 (With DNP3 Outstation)	960	88	95	96	93	58–82	156–157
16 (Without DNP3 Outstation)	1536	96	95	98	93	80–82	156–157
16 (With DNP3 Outstation)	1536	90	91	96	87	60–80	156–157
32 (Without DNP3 Outstation)	3072	95	94	97	91	63–80	157–158

Table 2 - IEC 61850 Client (Continued)

No. of Logical Nodes	Data Attributes	CPU0[(a)] Configuration		CPU1[(b)] Configuration		Startup Time (in seconds)	RAM Usage (in MB)
		CPU0 Idle %	CPU1 Idle %	CPU0 Idle %	CPU1 Idle %		
32 (With DNP3 Outstation)	3072	87	93	96	86	66–81	157–159
64 (Without DNP3 Outstation)	6144	93	91	96	89	66–80	159–161
64 (With DNP3 Outstation)	6144	78	87	95	74	59–80	160–161
125 (Without DNP3 Outstation)	12000	85	97	93	71	58–80	165–168
125 (With DNP3 Outstation)	12000	73	81	91	57	58–80	166–168
250 (Without DNP3 Outstation)	24000	76	90	89	48	59–80	173–174
250 (With DNP3 Outstation)	24000	69	90	85	49	61–80	174–176

(a) IEC 61850 Client configuration is running on CPU0.

(b) IEC 61850 Client configuration is running on CPU1.

Table 3 - IEC 61850 Server and Client

No. of IEDs	Data Attributes	CPU0[(a)] Configuration		CPU1[(b)] Configuration		Startup Time (in seconds)	RAM Usage (in MB)
		CPU0 Idle %	CPU1 Idle %	CPU0 Idle %	CPU1 Idle %		
2	592	95	98	96	98	58	158
5	1480	90	98	94	99	60	159
10	2960	85	97	93	98	58	160
16	4736	74	98	83	99	59	163
25	7200	51	97	73	98	58	166
50	14400	38	97	64	98	59	176
75	21600	34	97	46	98	58	185
100	28800	25	90	35	89	60	195

(a) IEC 61850 Server and Client configuration is running on CPU0.

(b) IEC 61850 Server and Client configuration is running on CPU1.

Table 4 - DNP3 Protocol Configuration Details

Number of Points			Number of Events/Second		
Digital Inputs	Analog Inputs	Counter Inputs	Digital	Analog	Counter
12500	12500	5000	50	50	20

Table 5 - DNP3 Protocol Performance Details - TCP/IP

DNP3		TCP/IP					
		CPU0[a] Configuration		CPU1[b] Configuration		Startup Time (in seconds)	RAM Usage (MB)
		CPU0 Idle (%)	CPU1 Idle (%)	CPU0 Idle (%)	CPU1 Idle (%)		
Without secured authentication	Outstation	93-95	90-92	93-95	97-99	124-175	130-132
	Controlling Station	80-82	84-86	94-96	82-84		
With SAv2 secured authentication	Outstation	64-66	94-96	95-97	56-58		
	Controlling Station	94-96	97-99	94-96	97-99		
With SAv5 secured authentication	Outstation	93-95	78-80	94-96	97-99		
	Controlling Station	79-81	83-85	93-95	83-85		

(a) TCP/IP configuration is running on CPU0.

(b) TCP/IP configuration is running on CPU1.

NOTE: DNP3 performance details are updated only for TCP interfaces.

Table 6 - DNP3 Protocol Performance Details - UDP

DNP3		UDP					
		CPU0[a] Configuration		CPU1[b] Configuration		Startup Time (in seconds)	RAM Usage (MB)
		CPU0 Idle (%)	CPU1 Idle (%)	CPU0 Idle (%)	CPU1 Idle (%)		
Without secured authentication	Outstation	92-94	97-99	94-96	97-99	124-129	129-136
	Controlling Station	80-82	84-86	96-98	64-66		
With SAv2 secured authentication	Outstation	65-67	94-96	95-97	57-59		
	Controlling Station	87-89	97-99	94-96	95-97		
With SAv5 secured authentication	Outstation	85-87	97-99	94-96	88-90		
	Controlling Station	79-81	96-98	93-95	80-82		

(a) UDP configuration is running on CPU0.

(b) UDP configuration is running on CPU1.

NOTE: DNP3 performance details are updated only for UDP interfaces.

Table 7 - DNP3 Protocol Performance Details - COM2

DNP3		COM2					
		CPU0[a] Configuration		CPU1[b] Configuration		Startup Time (in seconds)	RAM Usage (MB)
		CPU0 Idle (%)	CPU1 Idle (%)	CPU0 Idle (%)	CPU1 Idle (%)		
Without secured authentication	Outstation	74-84	97-99	94-96	68-78	125-176	136-138
	Controlling Station	78-82	84-88	94-96	97-99		
With SAv2 secured authentication	Outstation	55-65	92-99	88-96	66-76		
	Controlling Station	78-88	90-95	94-96	85-95		
With SAv5 secured authentication	Outstation	55-65	92-99	88-96	66-76		
	Controlling Station	78-88	90-95	94-96	85-95		

(a) COM2 configuration is running on CPU0.

(b) COM2 configuration is running on CPU1.

Table 8 - DNP3 Protocol Performance Details - V.11

DNP3		V.11					
		CPU0[a] Configuration		CPU1[b] Configuration		Start up time (m:s)	RAM usage (MB)
		CPU0 Idle (%)	CPU1 Idle (%)	CPU0 Idle (%)	CPU1 Idle (%)		
Without secured authentication	Outstation	82-92	88-98	92-96	72-82	2:15	135-139
	Controlling Station	90-96	80-86	94-97	97-99	1:22	
With SAv2 secured authentication	Outstation	50-60	95-99	90-94	70-80	2:01	
	Controlling Station	94-96	97-99	95-97	94-96	1:24	
With SAv5 secured authentication	Outstation	55-65	92-99	80-90	76-86	1:57	
	Control Station	82-86	97-99	94-96	90-94	1:32	

(a) V.11 configuration is running on CPU0.

(b) V.11 configuration is running on CPU1.

Table 9 - DNP3 Protocol Performance Details - V.28

DNP3		V.28					
		CPU0[a] Configuration		CPU1[b] Configuration		Start up time (m:s)	RAM usage (MB)
		CPU0 Idle (%)	CPU1 Idle (%)	CPU0 Idle (%)	CPU1 Idle (%)		
Without DNP3 authentication	Outstation	64-74	97-99	94-96	74-84	1:53	136-139
	Controlling Station	94-97	97-99	94-96	97-99	1:21	
With DNP3 authentication	Outstation	82-86	97-99	94-96	92-94	2:01	

Table 9 - DNP3 Protocol Performance Details - V.28 (Continued)

DNP3		V.28					
		CPU0[a] Configuration		CPU1[b] Configuration		Start up time (m:s)	RAM usage (MB)
		CPU0 Idle (%)	CPU1 Idle (%)	CPU0 Idle (%)	CPU1 Idle (%)		
	Controlling Station	94-96	97-99	96-98	95-97	1:22	
With SAv5 DNP3 authentication	Outstation	94-96	97-99	96-98	94-96	1:59	
	Controlling Station	94-96	97-99	96-98	92-96	1:00	
(a) V.28 configuration is running on CPU0.							
(b) V.28 configuration is running on CPU1.							

Table 10 - DNP3 Protocol Performance Details - Optical DCB

DNP3		Optical DCB					
		CPU0[a] Configuration		CPU1[b] Configuration		Start up time (m:s)	RAM usage (MB)
		CPU0 Idle (%)	CPU1 Idle (%)	CPU0 Idle (%)	CPU1 Idle (%)		
Without DNP3 authentication	Outstation	94-97	97-99	90-94	92-96	1:30	134-139
	Controlling Station	94-97	97-99	90-94	92-96	1:25	
With DNP3 authentication	Outstation	94-97	97-99	90-94	92-96	1:32	
	Controlling Station	94-97	97-99	90-94	92-96	1:27	
With SAv5 DNP3 authentication	Outstation	94-97	97-99	90-94	92-96	1:57	
	Controlling Station	94-97	97-99	90-94	92-96	1:44	
(a) Optical DCB configuration is running on CPU0.							
(b) Optical DCB configuration is running on CPU1.							

Table 11 - IEC 104 Controlled Station Performance

No. Of Slaves	No. of Logical RTUs	No. of Data-base Points	Redun-dancy	CPU0[a] Configuration		CPU1[b] Configuration		Memory Usage (MB)	Startup Time (in sec-onds)
				CPU0 Idle %	CPU1 Idle %	CPU0 Idle %	CPU1 Idle %		
16	16	5000	No	80-85	96-98	94-96	85-90	135-184	60-200
16	16	20000	No	60-90	96-98	94-96	65-95		
16	16	50000	No	60-80	96-98	94-96	65-85		
1	16	5000	No	80-85	96-98	94-96	85-90		
1	16	20000	No	60-90	96-98	94-96	65-95		
1	16	50000	No	60-80	96-98	94-96	65-85		
1	16	5000	Yes	80-85	96-98	94-96	85-90		
1	16	20000	Yes	60-90	96-98	94-96	65-95		

Table 11 - IEC 104 Controlled Station Performance (Continued)

No. Of Slaves	No. of Logical RTUs	No. of Database Points	Redundancy	CPU0[a] Configuration		CPU1[b] Configuration		Memory Usage (MB)	Startup Time (in seconds)
				CPU0 Idle %	CPU1 Idle %	CPU0 Idle %	CPU1 Idle %		
1	16	50000	Yes	60-80	96-98	94-96	65-85		
(a) IEC 104 Controlled Station configuration is running on CPU0.									
(b) IEC 104 Controlled Station configuration is running on CPU1.									

Table 12 - IEC 104 Controlling Station Performance

No. Of Controlling Stations	No. of Logical RTUs	No. of Database Points	Redundancy	CPU0[a] Configuration		CPU1[b] Configuration		Memory Usage (MB)	Startup Time (in seconds)
				CPU0 Idle %	CPU1 Idle %	CPU0 Idle %	CPU1 Idle %		
16	16	5000	No	75-90	96-98	93-95	80-95	132-198	250
16	16	20000	No	50-70	96-98	93-95	60-80		510
16	16	50000	No	50-70	96-98	93-95	58-78		700
1	16	5000	No	75-90	96-98	93-95	80-95		200
1	16	20000	No	55-75	96-98	93-95	60-80		420
1	16	50000	No	50-70	96-98	93-95	58-78		1420
1	16	5000	Yes	75-90	96-98	93-95	80-95		200
1	16	20000	Yes	55-75	96-98	93-95	60-80		420
1	16	50000	Yes	50-70	96-98	93-95	58-78		700
(a) IEC 104 Controlling Station configuration is running on CPU0.									
(b) IEC 104 Controlling Station configuration is running on CPU1.									

Table 13 - IEC 101 Master Performance

No. Of Controlling Stations	No. of Logical RTUs	No. of Database Points	Redundancy	CPU0[a] Configuration		CPU1[b] Configuration		Memory Usage (MB)	Startup Time (in seconds)
				CPU0 Idle %	CPU1 Idle %	CPU0 Idle %	CPU1 Idle %		
1	16	4000	No	94-96	97-99	88-92	94-96	127–136	171
1	16	16000	No	94-96	97-99	88-92	94-96		346
1	16	40000	No	94-96	97-99	88-92	94-96		596
(a) IEC 101 Master configuration is running on CPU0.									
(b) IEC 101 Master configuration is running on CPU1.									

Table 14 - Modbus Client and Server 8 Channel Serial Module RS485-2 Wire One-One Communication Performance Details

No. of Channels	No. of IED's	No. of Scan Groups	No. of Database Points	Modbus Protocol	CPU0[a] Configuration		CPU1[b] Configuration		Memory Usage (MB)	Startup Time (in seconds)
					CPU0 Idle %	CPU1 Idle %	CPU0 Idle %	CPU1 Idle %		
1	1	6	2277	Modbus Client	88-94	97-99	94-98	92-96	125-149	39-197
				Modbus Server	90-95	97-99	94-98	90-95		
1	1	160	2392-9	Modbus Client	84-88	97-99	94-98	86-90		
				Modbus Server	87-94	96-99	92-97	94-99		
8	8	48	1821-6	Modbus Client	50-60	95-99	84-94	60-70		
				Modbus Server	65-75	95-99	84-94	75-85		
8	8	1280	100,-232	Modbus Client	45-55	94-98	84-94	55-65		
				Modbus Server	60-70	95-99	84-94	70-80		

(a) Modbus Client and Server 8 Channel Serial module RS485-2 wire one-one communication configuration is running on CPU0.

(b) Modbus Client and Server 8 Channel Serial module RS485-2 wire one-one communication configuration is running on CPU1.

Table 15 - Modbus Client and Server 8 Channel Serial Module RS485-2 Wire Multidrop Communication Performance Details

No. of Channels	No. of IED's in multidrop	No. of Scan Groups	No. of Database Points	Modbus Protocol	CPU0[a] Configuration		CPU1[b] Configuration		Memory Usage (MB)	Startup Time (in seconds)
					CPU0 Usage (Idle %)	CPU1 Usage (Idle %)	CPU0 Usage (Idle %)	CPU1 Usage (Idle %)		
1	10	60	12880	Modbus Client	93-98	95-99	95-99	93-98	126-148	51-137
				Modbus Server	92-96	95-99	95-99	93-98		
8	80	480	103040	Modbus Client	60-70	95-99	84-94	70-80		
4	40	160	51520	Modbus Server	70-80	97-99	88-98	80-90		

(a) Modbus Client and Server 8 Channel Serial module RS485-2 wire multidrop communication configuration is running on CPU0.

(b) Modbus Client and Server 8 Channel Serial module RS485-2 wire multidrop communication configuration is running on CPU1.

Table 16 - Modbus Client and Server 8 Channel Serial Module RS485-2 and 4 Multidrop Communication Performance Details

No. of Channels	No. of IED's in multidrop	No. of Scan Groups	No. of Database Points	Modbus Protocol	CPU0[a] Configuration		CPU1[b] Configuration		Memory Usage (MB)	Startup Time (in seconds)
					CPU0 Usage (Idle %)	CPU1 Usage (Idle %)	CPU0 Usage (Idle %)	CPU1 Usage (Idle %)		
1	32	160	24000	Modbus Client	85-90	95-99	90-95	88-94	127-130	53-65
16	16	64	12000	Modbus Server	70-80	95-99	85-95	80-90		

(a) Modbus Client and Server 8 Channel Serial module RS485-2 and 4 multidrop communication configuration is running on CPU0.

(b) Modbus Client and Server 8 Channel Serial module RS485-2 and 4 multidrop communication configuration is running on CPU1.

Table 17 - Modbus TCP Client Configuration and Performance details

No. Modbus Client groups	No. of Modbus Clients per group	No. of Scan Groups	No. of Data-base Points	CPU0[(a)] Configuration		CPU1[(b)] Configuration		Memory Usage (MB)	Startup Time (in sec-onds)
				CPU0 Usage (Idle %)	CPU1 Usage (Idle %)	CPU0 Usage (Idle %)	CPU1 Usage (Idle %)		
1	1	8	4K	96-98	97-99	92-95	97-99	132-148	60-107
1	1	50	10K	90-93	97-99	93-96	97-99		
1	1	160	38K	55-57	96-98	62-64	90-92		
1	120	720	65K	49-53	96-98	55-58	92-94		
139	190	760	62K	40-43	96-98	49-53	90-92		

(a) Modbus TCP Client configuration is running on CPU0.

(b) Modbus TCP Client configuration is running on CPU1.

Table 18 - Modbus TCP Server Protocol Configuration Details

Number of Points				Number of Data changes /Second		Number of Controls /Twenty seconds	
Status_IP	Reg_IP	Coil_OP	Reg_ OP	Status_IP	Reg_IP	Coil_OP	Reg_OP
9999	9999	9999	9999	2000	2000	150	150

Table 19 - Modbus TCP Server Performance Details - 40k Database Points

Modbus Protocol	CPU0[(a)] Configuration		CPU1[(b)] Configuration		Startup Time (in seconds)	RAM usage (MB)
	CPU0 Usage (Idle %)	CPU1 Usage (Idle %)	CPU0 Usage (Idle %)	CPU1 Usage (Idle %)		
Modbus TCP Server	83-85	97-99	87-89	97-99	104	134

(a) Modbus TCP Server configuration is running on CPU0.

(b) Modbus TCP Server configuration is running on CPU1.

NOTE:

- Performance database contains 40K database points in a single Modbus TCP Server on a standalone SCD6000 configuration.
- Only Modbus TCP Server Protocol is configured.
- The maximum number of Modbus TCP Servers can be configured on single SCD6000 is 139.
- The SCD6000 configured with two Modbus TCP Servers with same database points can communicate with two Modbus Client.

Table 20 - SCD6000 Performance for Modbus TCP Server Function Codes

Measured Parameters	Time (Milliseconds)
Response time for Reading Coil_Out (FC 01)	5.9
Response time for Reading Status_IP (FC 02)	6.56
Response time for Reading Reg_Out (FC 03)	8.6

Table 20 - SCD6000 Performance for Modbus TCP Server Function Codes (Continued)

Measured Parameters	Time (Milliseconds)
Response time for Reading Reg_IP (FC 04)	5.58
Command Execution time for Write Single Coil (FC 05)	7.27
Command Execution time for Write Multiple Coils - 16 Coils in single request (FC 15)	6.94
Command Execution time for Write Single Register (FC 06)	8.26
Command Execution time for Write Multiple Registers - 16 Registers in single request (FC 16)	8.72
Read and Write Multiple Registers - 16 Registers (FC 23)	654

Table 21 - IEEE 1588 PTP Performance Details

Key Performance Indicator (KPI)	SCD6000 PTP Grand Master and SCD6000 Connected Directly	SCD6000 PTP Grand Master and SCD6000 Connected with PTP Switch
PTP Time Sync Accuracy	81 Nanoseconds	94 Nanoseconds

NOTE: The maximum number of PTP IED Slaves that SCD6000 PTP Master can time sync is 100.

Table 22 - Simple Network Time Protocol (SNTP) Performance Details

KPI	SCD6000 SNTP Server and SCD6000 SNTP Client Connected Directly
SNTP Time Sync Accuracy[a]	1–2 Milliseconds
(a) The value is based on a test performed in a laboratory environment with one client connected to the server.	

SCD6000 Modbus TCP Client Performance with Different Scan Periods

Table 23 - No. of Scan Groups Configured Per Device is 1 in Modbus Client

Scan Period	Devices Scanned	CPU0 Idle %	Total RAM Left %
100 ms	70	32	54
200 ms	135	32	52
500 ms	228	42	50
100 devices with 500 ms, 134 devices with 1 sec	234	44	47
100 devices with 500 ms, 134 devices with 2 sec	234	56	47

Table 24 - No. of Scan Groups Configured Per Device is 2 in Modbus Client

Scan Period	Devices Scanned	CPU0 Idle %	Total RAM Left %
100 ms	45	32	48
200 ms	100	38	47

Table 24 - No. of Scan Groups Configured Per Device is 2 in Modbus Client (Continued)

Scan Period	Devices Scanned	CPU0 Idle %	Total RAM Left %
500 ms	190	34	45
100 devices with 500 ms, 134 devices with 1 sec	229	32	42
100 devices with 500 ms, 134 devices with 2 sec	234	36	42

SCD6000 CPU Performance Running with Modbus TCP Client, IEC 61850, DNP3, and Hardware I/O

Table 25 - SCD6000 CPU Performance Running with Modbus TCP Client, IEC 61850, DNP3, and Hardware I/O

Scan Period	Devices Scanned	CPU0 Idle %	CPU1 Idle %	Total RAM Left %
100 devices with 500 m 134 devices with 2 sec	234	18–24	7–12	12

Configuration Details:

Core 0

DNP3 Outstation:

No. of Analog Input points	4689
No. of Analog Output points	1404
No. of Binary Inputs points	88

Hardware I/O of ADI points:

No. of DI points with SOE enabled	32

Core 1

Modbus TCP Clients:

No. of Modbus Client Groups	234
No. of Masters per Client Group	1
No. of Input Registers per Modbus Device	19
No. of Holding Registers per Modbus Device	6

IEC 61850 Server:

No. of Logical Nodes	234
No. of RTU points mapped in each data set	3

IEC 61850 Client:

No. of Servers connected	43

No. of Signals per Server:

- 21 Signals per Server in 2 IEDs
- 7 Signals per Server in 41 IEDs

Environmental Specifications

	Operating	Storage
Temperature	-4°F to +158°F (-20°C to +70°C)	-40°F to +185°F (-40°C to +85°C)
Relative Humidity	5% to 95% (non-condensing)	5% to 95% RH (non-condensing)
Altitude	-300 m to +2,000 m (-1,000 ft to +6,500 ft)	
Vibration	1 g (10 Hz to 150 Hz)	
Shock	5 g (18 Pulses for 11 ms each)	
Bump	10 g (6000 Pulses for 16 ms each)	

Regulatory Compliance

Electromagnetic Compatibility (EMC)	
European EMC Directive 2014/30/EU	• Meets EN 61326-1 Immunity requirements for industrial locations • EN 61000-6-5: Generic Standards - Immunity for power station and substation environments
CISPR 11, Industrial Scientific and Medical (ISM) Radio-Frequency Equipment - Electromagnetic Disturbance Characteristics - Limits and Methods of Measurement	Radiated emissions meet Class "A" limits Conducted emissions meet Class "A" limits
IEC 61000-4-2 ESD Immunity	Contact ±6 kV, air ±8 kV
IEC 61000-4-3 Radiated Field Immunity	• 10 V/m at 80 MHz to 1000 MHz • 3 V/m at 1 GHz to 6 GHz
IEC 61000-4-4 Electrical Fast Transient/Burst Immunity	±2 kV at 100 kHz for Signal Lines ±4 kV at 100 kHz for Power Lines
IEC 61000-4-5 Surge Immunity	±2 kV
IEC 61000-4-6 Immunity to Conducted Disturbances Induced by Radio Frequency Fields	10 Vrms at 150 KHz to 80 MHz
IEC 61000-4-16 Conducted, Common Mode Disturbances Immunity	For Power Lines: • 10 Vrms to 1 Vrms 15 Hz to 150 Hz • 1 Vrms 150 Hz to 1.5 kHz • 1 Vrms to 10 Vrms 1.5 kHz to 15 kHz • 10 Vrms 15 kHz to 150 kHz For Signal Lines: • 30 Vrms to 3 Vrms 15 Hz to 150 Hz • 3 Vrms 150 Hz to 1.5 kHz • 3 Vrms to 30 Vrms 1.5 kHz to 15 KHz • 30 Vrms 15 kHz to 150 kHz • 300 Vrms for 1 second short duration
IEC 61000-4-18 Damped Oscillatory Wave	• Common mode ±1 kV @1 MHz • Differential mode ±0.5 kV @1 MHz

Product Safety

This product complies with these safety standards:

- UL 61010-1 - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements
- CSA C22.2 NO. 61010-1 - Safety requirements for Electrical equipment for measurement, control, and laboratory use
- EN 61010-1:2010 - Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements

Physical Specifications

Table 26 - Physical Size for SCD6000, SCD6000-SVX, and RTU50 SVX

SCD6000	Module size: Each module is the size of a double Eurocard (233.4 mm x 160 mm board, 261.8 mm x 185 mm x 35.3 mm module). Connection: Plugs into a backplane (Electrobus) using a DIN 41612 connector. Required frame space: The module requires 35 mm of frame space. Carrier board dimensions: The dimensions of the SCD6000 CPU Carrier board are 160 mm X 145.48 mm ±0.2 mm. Power supply board dimensions: The dimensions of the Power Supply PCB board are 160 mm X 85.7 mm ±0.2 mm.
SCD6000-SVX and RTU50 SVX	Module size: The modules are the size of a double Euro card (233.4 mm x 106 mm board, 261.8 mm x 185 mm module). Connection: Plugs into a backplane (Electrobus) through a DIN 41612 connector. Required frame space: This CPU module requires frame space of 55 mm. Carrier board dimensions: The dimensions of its carrier board are: 160 mm X 145.48 mm ±0.2 mm.

Ordering Information

For Electrodynamic Controller-specific parts, see *EcoStruxure™ Electrodynamic Controller* Product Specification (PSS 41S-2EDC).

Table 27 - CPU Module

Part Number	Description
SY-60399001R-AS[a]	SCD6000 CPU OptoNet Power Supply Ethernet (COPE) Module (RoHS)
SY-60399002R-AS[a]	SCD6000 CPU OptoNet Ethernet (COE) Module (RoHS)
SY-60399008R-AS[b]	SCD6000 COPE TYPE II Assembly Module
SY-60399009R-AS[b]	SCD6000 COE TYPE II Assembly Module
SY-60399010R-AS[a]	SCD6000-SVX CPU Module
SY-60399012R-AS[b]	SCD6000-SVX CPU TYPE II Module
(a) These modules support 256 MB DDR3 RAM. (b) These type 2 modules support 1 GB DDR3 RAM.	

Table 28 - Optical Patch Cords

Part Number	Description
SY-6051034[a]	Optical Cable Assembly Multimode two ST to two ST 5 meters
P0972ZR[a]	Optical Cable Assembly Multimode two ST to LC 3 meters
(a) Request the factory for longer cables.	

Table 29 - SFP Modules

Part Number	Description
SY-6034085	10/100Base-T SFP Module
SY-6038038	100Base-FX SFP Module
SY-6038090	100Base-FX SFP Module (for Electrodynamic Controller applications only)

Related Documents

PSS 41H-8S6KAOV	*EcoStruxure™ Foxboro™ SCADA SCD6000 RTU Architectural Overview*
PSS 41H-8S6KMOD	*EcoStruxure™ Foxboro™ SCADA SCD6000 and SCD6000-SVX Power Supply, I/O, and Communication Modules*
PSS 41S-2S6KSWR	*EcoStruxure™ Foxboro™ SCADA RTU Station, RTV, and RTU Connect Secure Software*
PSS 41S-2S6KSAL	*EcoStruxure™ Foxboro™ SCADA SCD6000 State And Logic Language (SALL)*
PSS 41S-2EDC	*EcoStruxure™ Electrodynamic Controller*
B0780EQ	*EcoStruxure™ Foxboro™ SCADA SCD6000-SVX and RTU50 SVX Hardware User's Guide*
B0780DQ	*EcoStruxure™ Foxboro™ SCADA RTU Station (Foxboro SCADA Remote Devices and RTU50) User's Guide*
B0780DY	*EcoStruxure™ Foxboro™ SCADA Remote Terminal Viewer (Foxboro SCADA Remote Devices and RTU50) User's Guide*
B0780DP	*EcoStruxure™ Foxboro™ SCADA RTU Connect Secure (Foxboro SCADA Remote Devices and RTU50) User's Guide*
B0780DW	*EcoStruxure™ Foxboro™ SCADA SCD6000 Hardware User's Guide*
B0780DV	*EcoStruxure™ Foxboro™ SCADA RTU AC Transducer Module - Type 2 User's Guide*
B0700JB	*Electrodynamic Controller User's Guide*

⚠ **WARNING**: This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to www.p65warnings.ca.gov/.

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As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

PSS 41H-8S6KCPU, Rev E