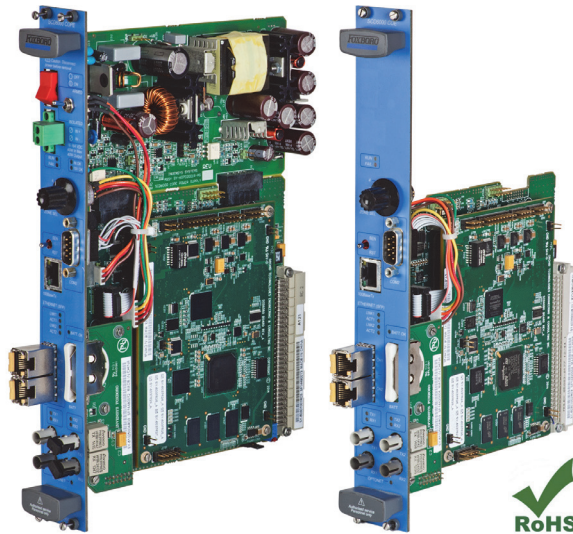


Foxboro Evo™ SCD6000 CPU OptoNet Power Supply Ethernet (COPE) Module/SCD6000 CPU OptoNet Ethernet (COE) Module



OVERVIEW

The Foxboro Evo™ SCD6000 CPU COPE/COE module inherits the functionality of the compact Foxboro Evo SCD5200 COPE/COE module. When this module is used in an SCD6000 IEC 61850 Gateway, it provides more dynamic RAM for a higher concentration of IEC 61850 Intelligent Electronic Devices (IEDs). The SCD6000 processor uses SFP receptacles to provide a simpler means of connection to the local area networks.

INTRODUCTION

Modularity is the key feature of the SCD6000. The CPU module is made up of:

- ▶ High Speed board
- ▶ Carrier board

- ▶ Power Supply board (COPE) (add-on board)

These three boards are integrated into a compact main processor board. In a distributed station computing device network, the COPE module is the heart of each node, where each COPE node manages its associated database, communications, and local applications. When utilized as a Data Control and Interchange Unit (DCIU), the COPE module provides:

- ▶ Data concentration capability
- ▶ SCADA communication
- ▶ Communication with Intelligent Electronic Devices (IEDs) over RS-232/RS-485
- ▶ Two 100 Mbps 100 Base-FX/100 Base-T and one 100 Base-T on RJ-45 Ethernet links

With its on-board OptoNet fiber optic network connectivity, the COPE module supports high performance and reliable peer-to-peer communication between the Station Computing Devices (SCD) nodes.

The COE module is a variant of the COPE module without the Power Supply board. The COE is used in the 10 I/O slot card file with a separate 65 W power supply.

FEATURES

CPU

- ▶ Dual ARM Cortex A9 SoC
- ▶ 256 MB DDR3 SDRAM
- ▶ 256 KB non-volatile RAM parameter memory
- ▶ 16 MB protected mode BIOS
- ▶ 64 MB Internal Flash storage
- ▶ Dedicated RJ-45 Diagnostic Ethernet port
- ▶ Watchdog timer
- ▶ RS-232/RS-485 programmable Serial port
- ▶ Two 100 Mbps fixed SFP ports
- ▶ Real-time calendar clock
- ▶ 7-year battery backup

OptoNet

- ▶ Dual ring network, with up to 63 nodes per network
- ▶ Deterministic, token-passing network protocol
- ▶ Total network length up to 5.8 km, maximum of 500 m between nodes
- ▶ Optical fiber (multi-mode glass) cables
- ▶ Fault tolerant to a single point of failure
- ▶ High speed data transfer
- ▶ Enables distributed data
- ▶ Availability of I/O data to all nodes
- ▶ Convenient low cost ST Tx and Rx connector

Power Supply (COPE only)

- ▶ Wide range input supply: 19.2 V to 148 V DC
- ▶ 40 W output capacity
- ▶ Compact high efficiency switch design
- ▶ Withstands 4 ms dead shorted power input
- ▶ Withstands 10 ms open circuit power input
- ▶ Over-current and over/under voltage protection
- ▶ Front panel LEDs and external fail alarm to monitor input supply and internal voltage
- ▶ On-board power supply disconnected when external Wide Range Input Power Supply module is used (Refer to PSS 31H-8K3R)

Ethernet

- ▶ Half/full duplex communications
- ▶ Dual 100 Mbps fixed SFP ports provide link and activity indications for each channel, and support either 100 Base-FX or 100 Base-T interface with Diagnostic LEDs
- ▶ One port that supports fixed 100 Base-T Ethernet interface on the RJ-45, is dedicated to Foxboro Evo Remote Terminal Viewer (RTV) connectivity

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 that support a frequency of 600 MHz.

The SCD6000 Carrier board has three Ethernet ports. Two of the ports are SFP ports that support pluggable 100 Base-FX or 100 Base-T interface modules. The third port supports a fixed 100 Base-Ethernet interface on the RJ-45 connector.

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 Master Station. This port supports an industrial standard DNP3 Slave, DNP3 Master, Modbus Slave, and Modbus Master protocols. It allows the implementation of proprietary protocols through the State And Logic Language High Level Serial Interface (SALL HLSI). (Refer to PSS 31S-2M15 for more information on SALL)

The Serial port supports logging of Sequence Of Events (SOE) to a printer or a terminal.

OptoNet

OptoNet on the SCD6000 CPU module is essentially a three-port hub, with all three ports controlled from a single ARCNET network controller chip. The two external ports are logically and physically identical. Port A and Port B can be connected between neighboring RTUs. These ports are half-duplex ports that can transmit and receive data individually thereby, creating two effective “rings”.

The third port is also a half-duplex port that is logically identical to the other two. It is an internal port that backs onto the ARCNET controller.

The RTU host processors configure the network automatically at the start-up, and are assigned network addresses according to their OptoNet node number.

The ARCNET controller chips are the only local intelligence (processing unit) on the OptoNet node modules and the RTU host processors direct the network activity. The ARCNET controller chips handle all the housekeeping tasks such as passing tokens, acknowledging messages, and checking for errors.

Power Supply

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 V DC) of the Power Supply subsystem allows the SCD to be powered from 24 V, 48 V, or 129 V DC 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. (Refer to PSS 31H-8K3R for more information).

Ethernet

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

The SCD6000 CPU module features three Ethernet ports:

- ▶ Two 100 Mbps fixed SFP ports to support either 100 Base-FX or 100 Base-T interface modules
- ▶ One 100 Base-T Ethernet port on the RJ-45 connector

The SFP Ethernet ports provide a cost-effective and versatile fiber optic and copper Ethernet interface for the SCD6000 module. The optical interface maintains high electrical isolation. The diagnostic LEDs provide link and activity indications for each SFP Ethernet channel. The Ethernet ports can simultaneously

support a maximum of 200 TCP/IP connections.

The Ethernet port on the RJ-45 is dedicated to RTV connectivity.

The Ethernet ports support communication with Master station(s) or TCP/IP enabled IEDs. Through

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

16 MB flash BIOS

64 MB flash file storage

256 KB non-volatile RAM

Peripheral Controllers

16550 type UART integrated with CPU

DP83620/DP83640 Ethernet controllers

COM20022 ARCNET controller

Bus Specifications

Foxboro Electrobus

Watchdog Timer

1 second timeout to reset the SCD

Front Panel

Power ON/OFF switch

Control/Isolate toggle switch

Control Selector switch

SEN/RST (Sense/Reset) switch

RUN and FAIL LED

Two SFP ports

One RJ45 Ethernet port

Two OptoNet Channel ports

One RS-232/RS-485 Serial port

Serial Ports

DB9 male sockets wired per TIA/EIA-574 (DTE)

RS-232/RS-485 (2 OR 4-WIRE) LINK SELECTABLE

Enables user configurable communications port

SUPPORTED PROTOCOLS

DNP3 (Master and Slave)

IEC 101 (Master)

Modbus (ASCII and RTU, Master and Slave)

HLSI (Generic configurable protocol interface)

GPS Clock (NEMA, Tekron, TrueTime, and others)

Real-Time Clock

IBM PC/AT compatible, with 7.5 ppm accuracy. It provides Electrobus synchronizing and SOE clocks

Backup Time

Real-time clock and non-volatile RAM are maintained during power outage through a user-replaceable lithium battery. The battery lasts 1 year in storage and 7 years in use.

An LED indicator and a software alarm are provided to indicate that the battery is low.

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 ports each containing a Transmit channel and a Receive channel support a dual ring ARCNET configuration

Maximum Length Between Nodes

500 meters

Maximum Size of OptoNet Network Ring

UP TO 12 NODES

5800 meters

FOR 12 TO 63 NODES

$[6280 - (40 \times \text{Number of nodes})]$ meters

Optical Cable

Glass fiber, multi-mode, 820 nm wavelength, dual 50/125 μm or 62.5/125 μm , ST connectors

Indicators

2 LEDs per port indicating Tx and Rx status
1 LED for indicating OptoNet communication

FUNCTIONAL SPECIFICATIONS FOR ETHERNET

SFP Fiber Interface⁽¹⁾

TRANSMIT POWER

-15.7 dBm

RECEIVE LEVEL

-31 dBm at bit error rate of 10^{-10}

RANGE

2000 m

Ports

- ▶ Two 100 Mbps fixed SFP ports to support either 100 Base-FX or 100 Base-T
- ▶ One RJ-45 port to support 100 Base-T

SUPPORTED PROTOCOLS

DNP3 (Master and Slave)
IEC 61850 (Client and Server)
IEC 60870-5-104 (Slave)
Modbus/TCP (Master)
Diagnostic interface
IED pass-through

Optical Cable

Glass fiber, multi-mode, 1310 nm wavelength, dual 50/125 μm or 62.5/125 μm , LC connector

Indicators

2 LEDs per port indicating link and activity

(1) SFP modules either Copper or Fiber need to be ordered separately. Refer to the table SFP Modules listed in page 7.

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 V DC

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

Withstands 4 ms dead shorted power supply input

Withstands 10 ms open circuit power supply input

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 V AC RMS for 1 minute Primary to Chassis and

Primary to Secondary isolation

NOTE

AT-FS201 from the Allied Telesis is a preferred media converter.

ENVIRONMENTAL SPECIFICATIONS

Operating

TEMPERATURE

-20°C to +70°C (-4°F to +158°F)

RELATIVE HUMIDITY

5 to 95% (non-condensing)

ALTITUDE

-300 m to +2,000 m (-1,000 ft to +6,500 ft)

Storage

TEMPERATURE

-40°C to +85°C (-40°F to +185°F)

RELATIVE HUMIDITY

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 11ms each)

Bump

10 g (6000 Pulses for 16 ms each)

REGULATORY COMPLIANCE

ElectroMagnetic Compatibility (EMC)

EUROPEAN EMC DIRECTIVE 2004/108/EC

Meets: EN 61326-1 Immunity requirements for industrial locations

CISPR 11, INDUSTRIAL SCIENTIFIC AND MEDICAL (ISM) RADIO-FREQUENCY EQUIPMENT - ELECTROMAGNETIC DISTURBANCE CHARACTERISTICS - LIMITS AND METHODS OF MEASUREMENT

Meets: 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 to 1000 MHz, 3 V/m at 80 MHz to 6 GHz

IEC 61000-4-4 ELECTRICAL FAST TRANSIENT/BURST IMMUNITY

2 kV on I/O, communication and 4 kV on DC power lines

IEC 61000-4-5 SURGE IMMUNITY

2 kV/1 kV on DC power lines; 1 kV on I/O and communication lines

IEC 61000-4-6 IMMUNITY TO CONDUCTED DISTURBANCES INDUCED BY RADIO FREQUENCY FIELDS

10 V (rms) at 150 KHz to 80 MHz on I/O, dc power and communication lines

IEC 61000-4-1 6 CONDUCTED, COMMON MODE DISTURBANCES IMMUNITY

10 V (rms) to 1 V (rms) 15 Hz to 150 Hz

1 V (rms) 150 Hz to 1.5 kHz

1 V (rms) to 10 V (rms) 1.5 kHz to 15 KHz

10 V (rms) 15 kHz to 150 kHz

IEC 61000-4-17 RIPPLE ON DC INPUT POWER PORT IMMUNITY

10% of the Nominal Voltage

IEC 61000-4-18 DAMPED OSCILLATORY WAVE

1MHz

up to +/-1 KV for common mode

up to +/-0.5 KV for differential mode

IEC 61000-4-29 VOLTAGE DIPS AND SHORT INTERRUPTIONS IMMUNITY

Voltage Dips: 30% for 100 ms, 60% for 100 ms, 0% for 50 ms

PRODUCT SAFETY

This product complies with the following safety standards:

- ▶ UL 61010-1 - Safety requirements for electrical equipment for measurement, control, and laboratory use - PART 1: GENERAL REQUIREMENTS - Edition 3
- ▶ 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

Physical Size

Each of modules 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). The module requires 35 mm of frame space and plugs into a backplane (Electrobus)

using a DIN 41612 connector.

The dimensions of the SCD6000 CPU Carrier board are 160 mm X 145.48 mm ±0.2 mm and the dimensions of the Power Supply PCB board are 160 mm X 85.7 mm ±0.2 mm.

ORDERING INFORMATION

Part Number	Description
SY-60399001R	SCD6000 CPU OptoNet Power Supply Ethernet (COPE) Module
SY-60399002R	SCD6000 CPU OptoNet Ethernet (COE) Module

OPTICAL PATCH CORDS

Part Number	Description
SY-6051034 ⁽¹⁾	Optical Cable Assembly Multimode two ST to two ST 5 meters
P0972ZR ⁽¹⁾	Optical Cable Assembly Multimode two ST to LC 3 meters

(1) Request longer cables from factory.

SFP MODULES

Part Number	Description
SY-6034085	100 Base-T SFP Module
SY-6038038	100 Base-FX SFP Module



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